

# PUBLIC WORKS

**June**  
**1952**

**CITY, COUNTY AND STATE**

Hydraulics of Sewers—  
a Notable Contribution

Business as Usual During  
Street Maintenance

Ten Ways to Use Herbicides  
for Roadside Control

Equipment Maintenance  
Pays New York City

Composting Turns Garbage  
Into Valuable Materials

Miami Gets Water for  
Doubled Population



George J. Fisher is Traffic Engineer and Superintendent of Streets and Sewers for Wichita, Kansas. He has made notable contributions in many fields of public works activities. More on page 16.

# *A fleet* of Street Maintenance Equipment



## HUBER Maintainer Serves Small City Many Ways

● A community of 3,000 residents, more or less, has nearly the same variety of street maintenance problems as larger cities—but usually the amount of money available for the job is limited.

Many communities are solving such problems by purchasing a Huber Maintainer because this single machine, with attachments, serves as a fleet of maintenance equipment.

As a lift-loader, the Huber loads trucks, removes manhole covers and lays pipe. With a bulldozer attachment it does a variety of backfilling jobs. Its maintainer blade keeps alleys smooth and clean and handles grading jobs.

With other HYDRAULICALLY controlled attachments the 6,000-lb., 42½ H.P. Huber can serve as a highway mower, berm leveler, road planer, snow plow, broom or patch roller. Let your nearest Huber Distributor tell you more about the versatile Maintainer and how it can work for you.

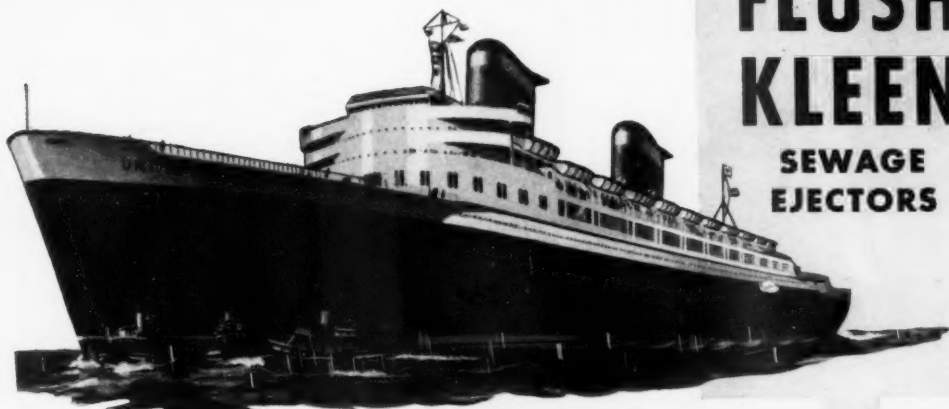
**HUBER MANUFACTURING CO. • Marion, Ohio, U. S. A.**  
Manufacturers of Huber Maintainers, Graders and Complete Line of Rollers





THE GREAT NEW AMERICAN  
FLAG SUPERLINER

# S. S. UNITED STATES



Built for United States Lines by the Newport News Shipbuilding and Drydock Company, Gibbs & Cox, Naval Architects under auspices of the United States Maritime Administration.

The new S.S. United States, the largest, fastest and safest superliner ever built in this country, is equipped with many duplex sets of FLUSH-KLEEN EJECTORS (more than enough sewage pumping capacity to meet the need of a good-sized town).

FLUSH-KLEEN EJECTORS were selected on a proven record of ship performance... since 1936 they have been giving *trouble-free service, clog-proof operation and low-cost maintenance* on numerous troop transports, cargo ships, hospital ships, as well as on the "America", now our country's second largest passenger ship.

The selection of FLUSH-KLEEN EJECTORS for the new "United States" reflects the acceptance that these units have gained from engineers who design pumping stations for commercial or industrial plumbing systems, and municipal lift stations—as more than 5,000 Duplex Flush Kleen Ejectors are now in operation in plants the country over.

If you do not have all the facts about FLUSH-KLEEN EJECTORS, please request Bulletin No. 122—it will be sent to you promptly.

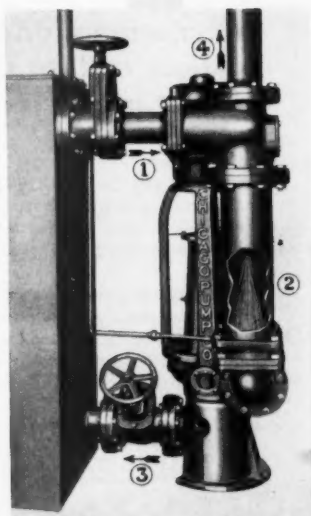
The positive clog-proof operation of FLUSH-KLEEN EJECTORS is readily understood by referring to the cut-away illustration.

**FILLING WET WELL**—(1) Sewage flows through inlet pipe. (2) Sewage solids are retained by strainer. (3) Strained sewage flows through idle pump to basin.

**PUMPING**—(3) Strained sewage is pumped from basin. (2) Sewage solids are backwashed from strainer. (4) Special check valve closes; sewage and solids are pumped overboard.

IS EQUIPPED  
WITH  
**FLUSH  
KLEEN**  
SEWAGE  
EJECTORS

CHICAGO  
SEWAGE  
EQUIPMENT



## CHICAGO PUMP COMPANY

### SEWAGE EQUIPMENT DIVISION

622 DIVERSEY PARKWAY

Flush Kleen, Scrub-Peller, Plunger,  
Horizontal and Vertical Non-Clog  
Water Seal Pumping Units, Samplers.



CHICAGO 14, ILLINOIS

Swing Diffusers, Stationary Diffusers,  
Mechanical Aerators, Combination  
Aerator-Clarifiers, Comminutors.

# Watch Dogs of the Water Supply

## ... FOR 5,800 FAMILIES



**ON THE ALERT** for any power failure that threatens the water supply are Latham's assistant superintendent, Walter Willder, and an International U-1 gasoline engine ready to take over with a throw of the clutch.



**PROGRESSIVE MANAGEMENT** is reflected in this well-planned and maintained pumping station of the Latham Water District. The International standby power unit shown maintains water pressure if electric power fails.

### International engines stand by on 24-hour call for the Latham Water District in the land of Ethan Allen

Like modern minute-men, three International engines guard Latham's water supply against sudden power failure. This is part of progressive Latham's program of service to the thousands of upstate New York families and many industries it serves.

Like Latham, many Water Districts today are finding International the power to count on in a pinch, and because International is recognized everywhere for good work, stockholders, voters and utilities executives respect the purchase of

International as sound judgment.

So get down to cases with your International Industrial Distributor or Power Unit Dealer. Let him show you installations in your neighborhood where Internationals are delivering the goods. Go through his modern service shop and complete parts department, and watch his trained mechanics in action.

Then you'll know why you, too, can rely on International "Power that Pays!"

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILL.

**POWER THAT PAYS**



**INTERNATIONAL**

Now's the time to mail this month's Readers' Service card.

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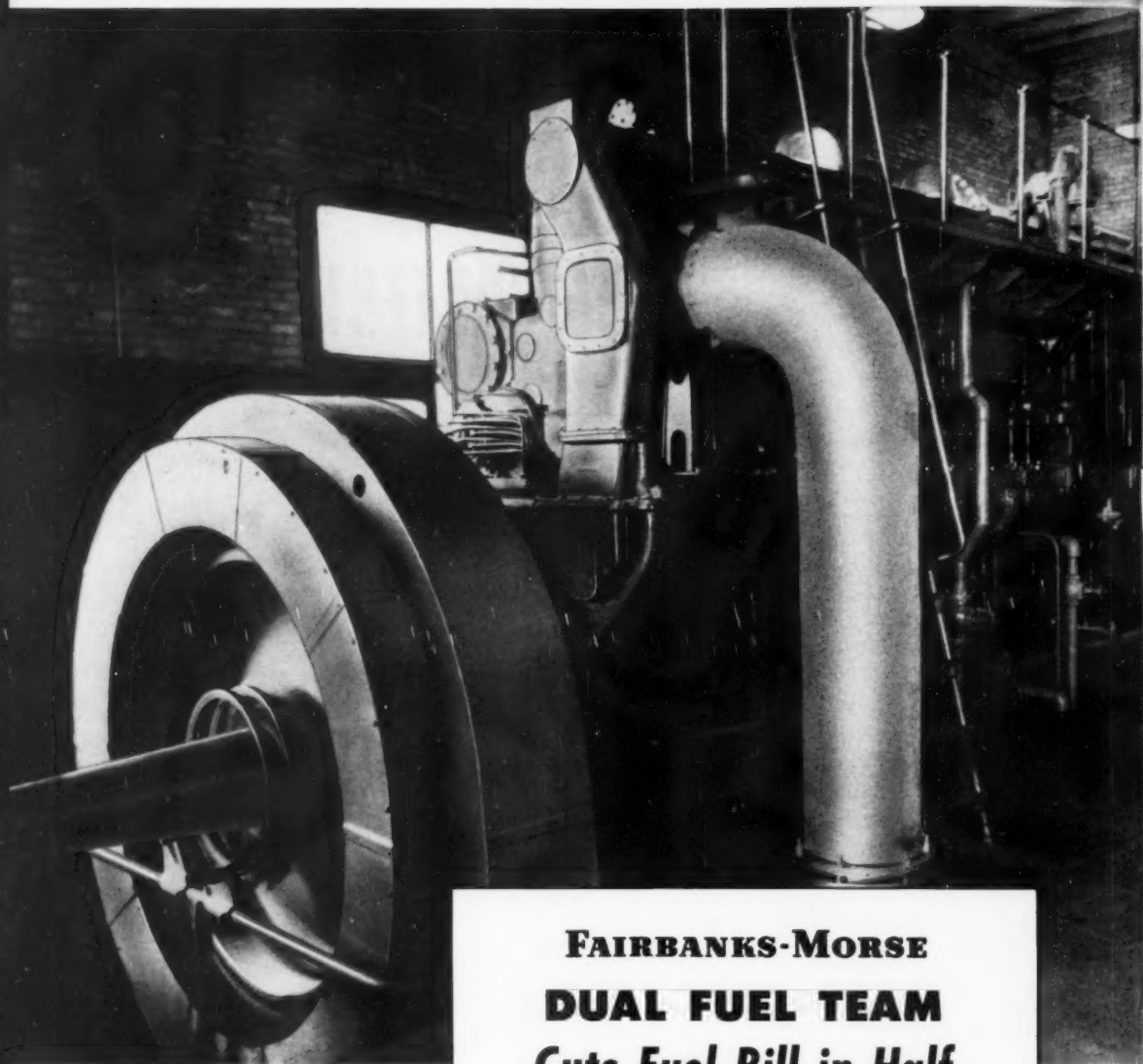
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**THE ENGINEERING AUTHORITY  
IN THE CITY-COUNTY-STATE FIELD**



## **FAIRBANKS-MORSE DUAL FUEL TEAM *Cuts Fuel Bill in Half***

Here at Benton, Arkansas, is the leader of the Fairbanks-Morse dual fuel team that cuts this municipality's fuel bill in half... saving \$36,000 annually.

Installed as a dual fuel unit, this 2000 hp. Model 33 started plant conversion to full gas operation. Two other Fairbanks-Morse diesels were equipped with dual fuel accessories, and now the 4200 hp.

team carries the entire load... at the low cost of only 3.36 mills per kw-h. All three engines can operate on gas or switch instantly to full diesels without dropping the load.

On standby duty are three more Fairbanks-Morse diesels, completing the team that assures this community low-cost, dependable power. Fairbanks, Morse & Co., Chicago 5, Illinois.

Put Your Power Costs in Order with Fairbanks-Morse Dual Fuel Economies.



## **FAIRBANKS-MORSE,**

***a name worth remembering***

## THE EDITOR'S POINT OF VIEW



### A Welcome to Young Engineers— and Some Advice

**A**T this time of the year there are new faces among engineers—the young men who graduate from our engineering colleges. We welcome them into engineering. May they have as much return in enjoyment and satisfaction in their work as we have had.

It has been our good fortune to have had, especially during the five and a half years of the late war, supervision over a great many young engineers. We shall presume on that experience to give some advice to these new engineers; but first we want to say that they are indeed fortunate in the fine preparation they have had for their profession.

Complete honesty is, of course, the first essential of an engineer. Following that come such qualities as resolution and determination; imagination and initiative; energy and industry; and a desire to know more and more about engineering. The engineer must learn, also, how to get along with his coworkers and how to work with other professions. He will find the road easier if he trains himself to speak and write clearly and understandably.

So welcome, engineers, to a fine profession. We are sure you will enjoy it.

### Books and the Engineer

**S**OME engineers are a mite slow to build up a good library of engineering books and then keep that library up to date. Of course, the cost of engineering books, like membership in engineering societies, is a proper income tax deduction. But even if it weren't, every engineer should maintain a decent shelf of engineering texts.

And these books should not be the standby books of twenty years ago. It is true that steel was about as strong then as it is now; and that Kutter's formula applied then and applies now—and so on ad infinitum. But, fancy, designing a sewage treatment plant on the basis of the knowledge and standards of twenty years ago; or designing a modern highway; or doing any one of a score of other engineering jobs on the same basis. It may be done, but it shouldn't be.

Materials are different; new processes have

been developed and proven; equipment, undreamed of twenty years ago, is available; construction methods, and the design on which these are based, have had to be revised in the light of present day costs. Let's get out of the Rip Van Winkle class. Let's be modern enough to give the people we serve the best of the new knowledge of engineering. We wouldn't want a doctor who was twenty years behind the time; why should anyone want an engineer who is in the same category?

### Designing Public Works for Lower Costs and Better Results

**M**UCH can be accomplished in reducing construction costs by better design. This may be done in at least two ways. One of these is to learn the abilities of labor-saving machinery and to design the structure so that such equipment can be used to the maximum. Another way is to study closely the construction methods used in building each structure that has been designed, and to discuss with the contractors possible changes that would have reduced the cost. Some of the suggestions, of course, have to be taken with a grain of salt so far as the individual contractor is concerned. However, a great deal can be learned in this way about cost reduction. Consideration also should be given to the preferences of contractors. For instance, most contractors will prefer to use a pipe rather than build a short concrete channel or flume, because costs on the piping can be figured more easily and construction is simpler and offers less chance for loss. One engineer we know, who operates in a limited area, has reduced his bid costs quite materially by studying the habits and methods of his contractors.

In these days of very high costs, good design is necessary. This should aim, first of all, in giving the community what it needs, secondly it should aim at low construction costs, and third it should provide the lowest possible operational and maintenance costs.

Added to these essentials should be the use of the very best materials and equipment that is available. Economy in either construction or service is never obtained with inferior materials. Both are costly in the long run.



# Why cast iron pipe



Need more facts about advertised products? Mail your Readers' Service card now.

# can and does save

## Millions of Tax Dollars

The answer, of course, is (1) cast iron pipe serves for centuries, and (2) over 95% of the pipe in service in America's water distribution systems is cast iron pipe. But let's get down to figures.

The cumulative cost of our water supply systems, from 1817 to 1951, is estimated at \$6-billion, of which more than \$3.5-billion is for cast iron pipe, including installation costs. The balance is for pumping stations, filter plants, storage facilities, etc.

Most of this money was raised by the issuance of bonds. Now, the useful life of cast iron pipe is at least 4 to 5 times the average term of a water revenue bond issue. Records prove that more than 35 American cities have cast iron mains in service that were installed over 100 years ago. A survey sponsored by three waterworks associations shows that 96% of all six-inch and larger cast iron pipe *ever laid* in 25 representative cities is still in service.

Add it all up and the answer is clear that, by serving for generations after bonds issued to pay for them have been retired and forgotten, cast iron mains save many millions of tax dollars.



One of a number of cast iron water mains which have been in service in New York City for more than a century. Over 35 other cities have century-old cast iron mains in service.

CAST IRON

## CAST IRON PIPE

*America's No.1 Tax Saver*

© 1952, Cast Iron Pipe Research Association

CAST IRON PIPE RESEARCH ASSOCIATION, THOS. F. WOLFE, MANAGING DIRECTOR, 122 SO. MICHIGAN AVE., CHICAGO 3.

Now's the time to mail this month's Readers' Service card.

**30  
ACRES**

## of trickling filters at Baltimore's Back River Plant...



Largest trickling filter installation in the world, Baltimore's Back River Plant contains fifty 157' 6" dia. Dorco Distributors serving an area of 30 acres! This section of the plant provides low-rate filter treatment for 239 of the total 259 MGD capacity. The remaining 20 MGD are treated by the activated sludge process.

Baltimore is a good example of how Dorr equipment fits almost every step in every sewage treatment flowsheet. In addition to the fifty

Distributors, the Back River Plant has installed three Dorr Detritors, two square and four round Dorr Clarifiers, two Activated Sludge Thickeners, one Elutriation Thickener and five 100' dia. Dorr Digesters.

If you don't already have Bulletin No. 6041, Dorr Equipment and Methods for Modern Sewage Treatment, write for a copy today. The Dorr Company, Stamford, Conn.



Better tools TODAY to meet tomorrow's demand

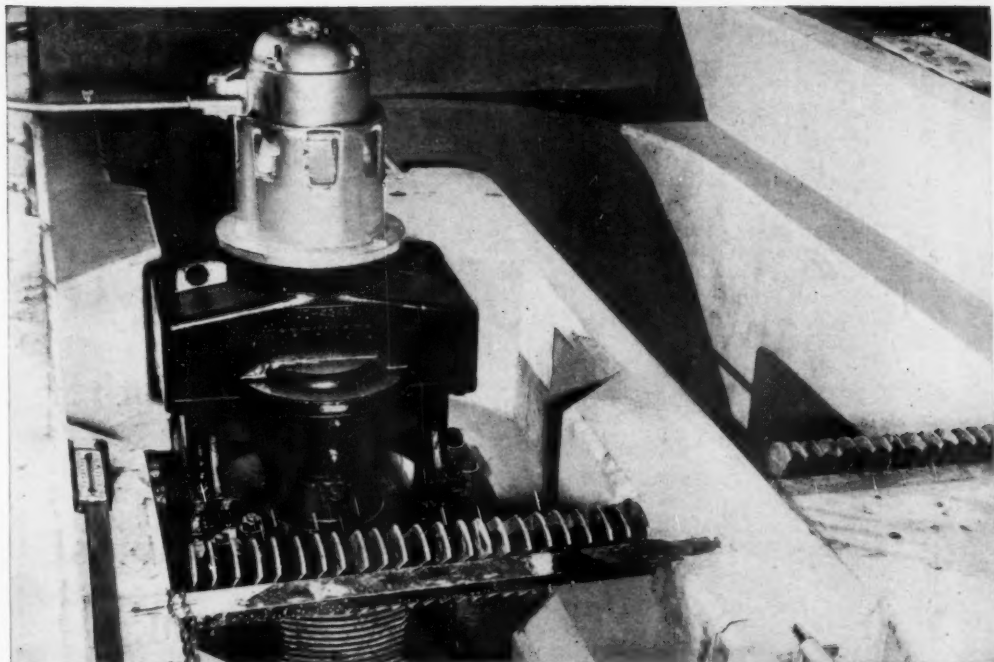
# DORR

WORLD - WIDE · RESEARCH · ENGINEERING · EQUIPMENT

THE DORR COMPANY · ENGINEERS · STAMFORD, CONN.

Offices, Associated Companies or Representatives in principal cities of the world.

Thousands use our Readers' Service card to keep up to date . . . do you?



WORTHINGTON COMMUNUTOR IS EASILY INSTALLED TO HANDLE LARGE VARIATIONS IN FLOW like this one at the Madison-Chatham (N. J.) Sewage Treatment Plant. Maximum wet-weather flows are occasionally as high as five times the average design dry-weather flow. An overflow screen is installed on top of the comminutor to screen flows

in excess of the comminutor's capacity. Screenings are later raked down into the comminutor during period of normal flow. The overflow screen makes the comminutor independent of the by-pass on right which may later be used as a channel for a second comminutor. Plant Superintendent is Edward P. Molitor.

## Madison-Chatham, N. J., installation proves adaptability of Worthington COMMUNUTOR

Typical example of the adaptability of the Worthington comminutor is the story of this installation at the Madison-Chatham Joint Meeting Sewage Treatment Plant in Chatham, N. J.

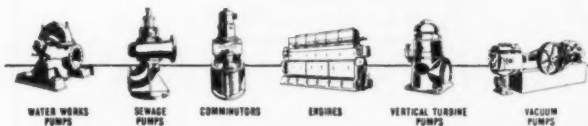
Engineers everywhere especially like the Worthington comminutor because:

- It can be readily installed in new or existing straight-flow rectangular channels.
- Cutter-racks are quickly removable for sharpening or replacement.

- It may be flooded without damage because it's protected by a mercury seal.

Worthington's public works specialists are ready to work with your community's engineer in solving screening problems—as well as other problems in sewage, water works, or municipal power generation. Write for Comminutor Bulletin W-2010-B3. Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Public Works Division, Harrison, N. J.

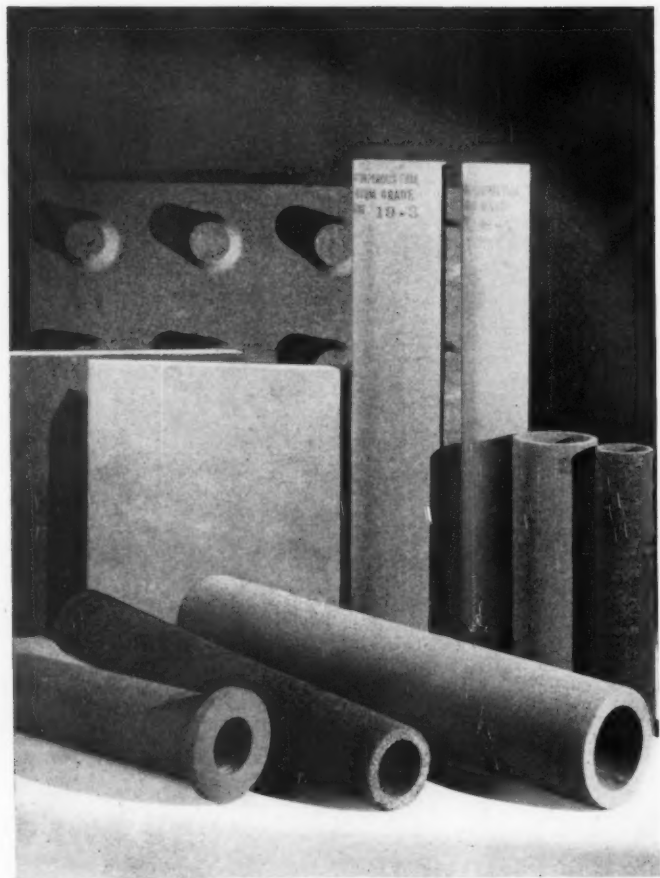
W. 2.5



All Major Public Works Equipment Under One Responsibility



It's a fact . . . our handy Readers' Service card is the easy way to get new catalogs.



**NORTON ALUNDUM® POROUS MEDIUMS** are available in a wide range of sizes in the form of plates, tubes and discs. Plates in the rapid sand filters for water filtration, plates and tubes for aeration in activated sludge treatment plants, seamless tubes in diatomite filters for filtration in municipal swimming pools.

**No other  
porous  
mediums  
make  
uniform flow  
so certain**

Only Norton ALUNDUM porous mediums are made with the patented Norton "controlled structure" process. That's why you'll value Norton ALUNDUM porous plates and seamless tubes beyond all others. No other porous mediums have such uniformly distributed pores in the right size and open-pore ratio.

#### **OTHER VALUABLE PROPERTIES**

Norton ALUNDUM porous mediums are relatively unaffected by the acid and alkaline conditions normally encountered in aerating and filtering applications. Their great strength and extreme resistance to abrasion give them extra long life.

Their resistance to properly applied temperatures up to 1800 F permits you to burn off organic matter if

pores become clogged. The seamless feature of ALUNDUM tubes assures uniform cleaning in backwashing.

#### **WRITE FOR INFORMATIVE BULLETINS**

Illustrated bulletins full of facts, charts, and tables tell you all you need to know about Norton porous mediums. They're yours for the asking. Write us direct. **NORTON COMPANY**, 224 New Bond Street, Worcester 6, Mass. Export: Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

\*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries



**NORTON**

**POROUS MEDIUMS**

*Making better products to make other products better*

**NORTON COMPANY, WORCESTER 6, MASSACHUSETTS**

Get full details of this month's new products . . . mail your Readers' Service card today.



# Takes curves in stride!



Maintaining this mountain road in Tulare County, California, is no cinch. It climbs about 6,300 feet in 25 miles. It pitches curve after curve at you. In places, spring rains and melting snow wash out cuts some 30 feet wide and 30 feet deep. All factors considered, the job calls for equipment that combines stamina for tough going with blading efficiency for short turns.

Some of the county men were frankly skeptical about the ability of "Caterpillar" Motor Graders to do this type of work. They're no longer skeptical. After a tryout, they put two "Cat" No. 12 Motor Graders on the road. Spreading gravel, grading, cleaning out borrow pits and filling in deep cuts, these units handled the assignment to everyone's satisfaction.

Year after year, in all kinds of going, sturdy "Caterpillar" Motor Graders have proved themselves economical, dependable tools for road maintenance. More than 9 out of 10 ever built are still on the job. Rugged as they are, they'll stand up even longer for you with good care—a few minutes' attention a day is all it takes to keep them in top-notch condition. Your "Caterpillar" Dealer is nearby to help you—call on him for service!

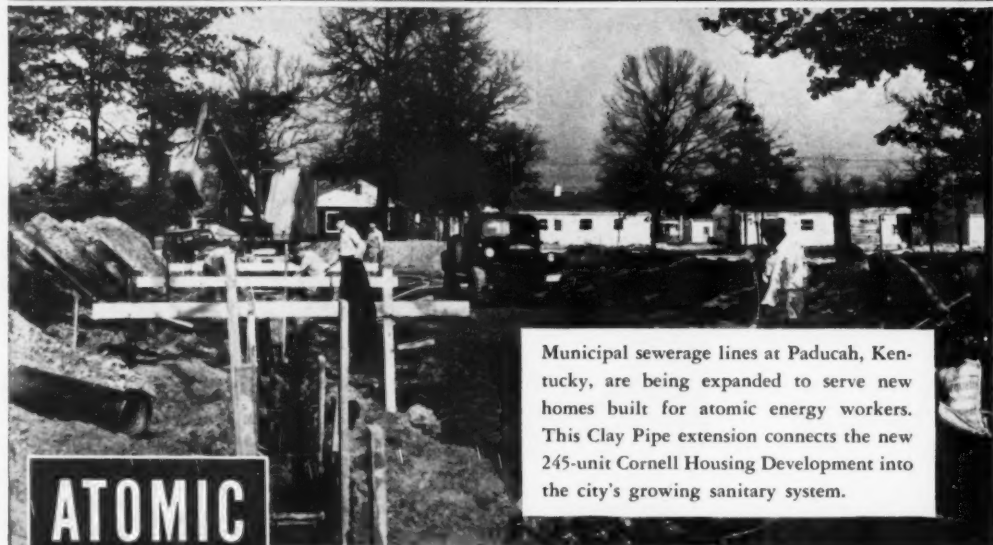
CATERPILLAR, PEORIA, ILLINOIS

## CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES  
TRACTORS • MOTOR GRADERS  
EARTHMOVING EQUIPMENT

## CLAY PIPE—ESSENTIAL ★ ECONOMICAL ★ EVERLASTING



Municipal sewerage lines at Paducah, Kentucky, are being expanded to serve new homes built for atomic energy workers. This Clay Pipe extension connects the new 245-unit Cornell Housing Development into the city's growing sanitary system.

# ATOMIC CENTER

## EXPANDS CLAY PIPE SEWERAGE FACILITIES

Once-peaceful Paducah, now swarming under an influx of atomic energy workers which is expected to double the city's population, is meeting its new sanitary sewerage needs with Vitrified Clay Pipe.

Thousands of feet of Clay Pipe are being installed in one of the largest expansion programs ever undertaken in the state of Kentucky. Plans call for a total expenditure of \$2.5 million.

In Paducah, as in leading defense centers the country over, readily-available Clay Pipe is going into the ground at a record rate. It's the one pipe that can be de-

pended on for unfailing service—year after year, decade after decade. Chemically-inert clay can't be affected by acids or corrosive fluids. Its protection is permanent. *It never wears out!*

### NATIONAL CLAY PIPE MANUFACTURERS, INC.

311 High Long Bldg., 5 East Long St., Columbus 15, Ohio  
100 North LaSalle St., Room 2100, Chicago 2, Ill.  
703 Ninth & Hill Bldg., Los Angeles 15, Calif.  
206 Connally Building, Atlanta 3, Georgia

*Vitrified*

# CLAY



# PIPE

### Wherever Reliable, Performance-Proved Pipe Is Needed, Specifications Call for Vitrified Clay

Panama City, Fla. (Municipal Expansion)	450,000 ft.
Bakersfield, Calif. (Municipal Expansion)	313,000 ft.
Limestone, Maine (Air Force Base)	65,000 ft.
Rapid City, S. D. (Air Force Base)	54,000 ft.
Orlando City, Fla. (Air Force Base)	74,000 ft.
Tucson, Ariz. (Air Force Base)	440,000 ft.
Morrisville, Pa. (New Steel Defense Plant)	300,000 ft.
Rantoul, Ill. (Chanute Field)	158,000 ft.

C-152-4

Now's the time to mail this month's Readers' Service card.

## EFFICIENT MOBILE AIR POWER for UTILITIES

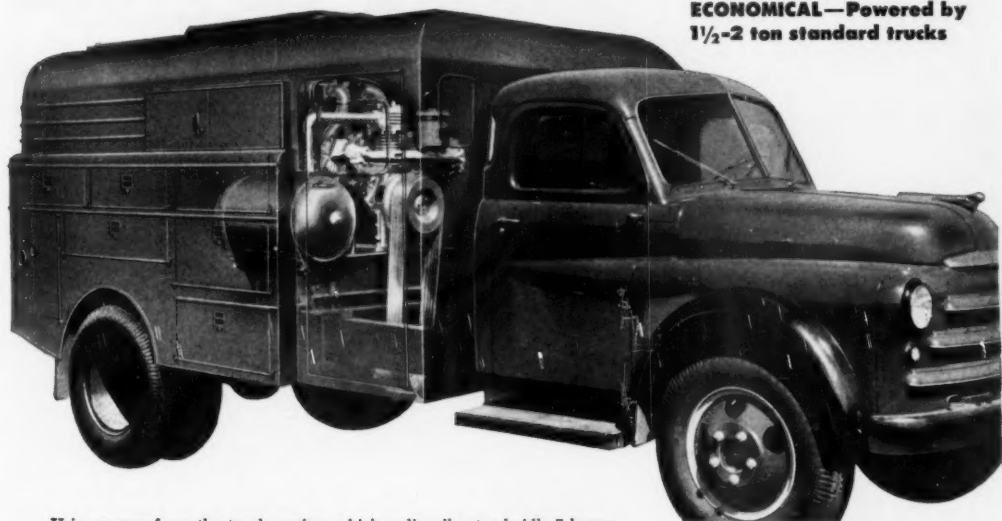
### Jaeger Travel-air compressor with Cemco power take-off

**125 CFM OF AIR**  
runs 2 heavy breakers

**NO VIBRATION—2 stage,  
W-type compressor unit**

**SIMPLE AUTOMATIC  
CONTROL of Engine Speed**

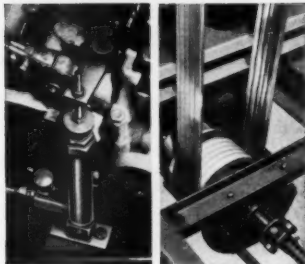
**ECONOMICAL—Powered by  
1½-2 ton standard trucks**



Using power from the truck engine, which ordinarily stands idle 7 hours out of 8, the Travel-air delivers 125 cfm at 100 psi — the air you need to run 2 heavy pavement breakers at full pressure — with engine operating at an easy 1750 rpm (24 mph speedometer). The automatic control that regulates engine speed to air requirements is simple, positive, employs no complicated linkage. Average engine life, on compressor service, is equivalent to 200,000 miles.

Cemco take-off has only 4 moving parts — no gears. Easy to mount on 1½ and 2 ton Chevrolet, Ford, Dodge, GMC and International trucks of long wheelbase model. For full information, and prices \$950 to \$1000 lower than trailer-type compressors requiring separate engine, see your Jaeger distributor or send for Catalog TC-1.

Every major utility, from New York to California, that has installed Jaeger Travel-air Compressors on their service trucks has ordered additional units for their fleets.



Speed Control

Power Take-Off

#### "Air Plus" Trailer Compressors deliver up to 25% more air to match today's tools.



At full pressure, air tools do 30% to 40% more work than at 70 lbs. pressure. Jaeger's "new standard" ratings insure full pressure operation.

Model 75 operates a heavy breaker, Model 125 two heavy breakers, Model 185 three heavy breakers at full pressure. 250, 365 and 600 ft. models offer comparable advantages. Catalog JC-1.

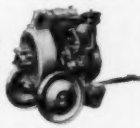


#### "Sure Prime" Pumps: Capacities to 240,000 gph; pressures up to 275 lbs.



Heavy duty dependability and long service in portable pumps for all types of drainage work, by-pass pumping, jetting and emergency water supply.

Aluminum pumps: 1½" Bantam (60 lbs.) 5100 gph; 2" (105 lbs.) 9000 gph. 2" to 10" semi-steel dewatering pumps; 3" to 6" high pressure pumps. Write us for Catalog P-10.



Sold, rented, serviced by leading distributors in 153 cities of U.S. and Canada

## THE JAEGER MACHINE COMPANY

400 Dublin Avenue  
Columbus 16, Ohio

CONCRETE MIXERS • HOIST TOWERS • AGGREGATE SPREADERS • SCREW SPREADERS and FINISHERS for CONCRETE PAVEMENTS

Thousands use our Readers' Service card to keep up to date . . . do you?



# 576 Weekly Calls...

## THE GARBAGE MAN *won't* MAKE

The photograph above shows part of a 576-home project in Cuyahoga Falls, Ohio, where no garbage man will ever call.

That's progress . . . and a real saving in manpower, too . . . because a Westinghouse Waste-Away® Food Waste Disposer is being installed in each kitchen. Down the drain goes food waste, before it becomes garbage, shredded to the right consistency and flushed away with the proper amount of water.

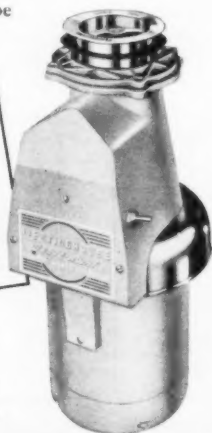
Yes, the Waste-Away is the ideal solution to a real problem—that of food waste disposal. It is safe, clean, efficient—engineered by Westinghouse for years of trouble-free service.

Why not consider this method of disposal for your own community? We will be happy to consult with you. Just write.

**Westinghouse**  
**WASTE-AWAY**  
ELECTRIC FOOD WASTE DISPOSER

. . . of course, it's electric!

**WESTINGHOUSE ELECTRIC CORPORATION**  
Electric Appliance Division • Mansfield, Ohio



**YOU CAN BE SURE...IF IT'S Westinghouse**

It's a fact . . . our handy Readers' Service card is the easy way to get new catalogs.



### LEADERS IN THE PUBLIC WORKS FIELD



George J. Fisher is Traffic Engineer and Superintendent of Streets and Sewers of Wichita, Kans., a position which he has held for the past five years. He has demonstrated leadership and originality of thought in this and other positions and his contributions to traffic engineering and to street maintenance and repair have been widely recognized. Back in 1942, he directed intensive research on traffic signs for blackout driving; and later he investigated the problem of loading and unloading merchandise from trucks on the streets of central business areas of cities.

Mr. Fisher was graduated from Antioch College in 1927 with a BS degree. He is an Ohioan and served in the traffic engineering division of that state before coming to Wichita. In the meantime, he was at Oak Ridge, Tenn., for a year as city traffic engineer. He is a member of the APWA, the FSWA, the ARBA, the Institute of Traffic Engineers and the Highway Research Board. He is married and he and Mrs. Fisher have a 14-year old daughter Judy. They live in Wichita. In his spare time (if any) Mr. Fisher works in his home workshop (repairing and building furniture, he says) and also likes bowling.

Mr. Fisher is another whom we welcome to our Leaders in Public Works, for he has shown energy, initiative and imagination, and he has demonstrated administrative and organizational skills.

# Barber-Greene

## *Runabout* SERVICE DITCHER



850021

The Hydra-Crowd — hydraulic transmission of power to the driving wheels — allows the operator of the Runabout, with a twist of the wrist, to keep it going at top digging efficiency through varying soil conditions.

### SEND FOR BULLETIN!

Send for Bulletin 705-A which describes completely all the advantages you gain when you use a Model 705-A Runabout Service Ditcher.

## with *HYDRA-CROWD*

**finger-tip hydraulic control of crowding speed  
independent of bucket line speed**

The Model 705-A Runabout now features the Hydra-Crowd, which provides an infinite range of crowding speeds from 0 to 16 f.p.m., independent of bucket line speed. With its 15 m.p.h. road speed and Vertical Boom milling action — and new Hydra-Crowd control — the Runabout combines mobility and digging efficiency to make possible lowest cost per foot of trench in all digging conditions the year around.

### Outstanding Runabout Performance Features

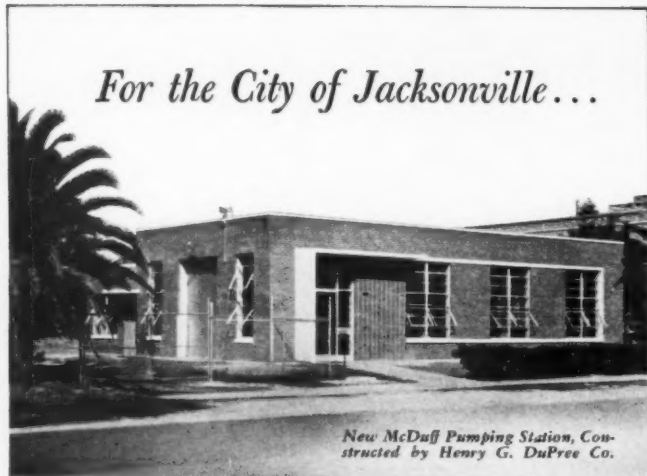
Year around operation  
5½", 7½", 10½" cutting widths  
down to 48" deep  
15 m.p.h. road speed  
Control of digging from cab  
or ground

Fastest digging in everything from  
loam to coral rock  
Instant stop—quick reverse  
Digs clean trench—no ramp to be  
dug by hand  
One-man operation

## Barber-Greene, Aurora, Illinois

Get full details of this month's new products . . . mail your Readers' Service card today.





*For the City of Jacksonville...*

*New McDuff Pumping Station, Constructed by Henry G. DuPre Co.*

## IT'S 100% **SIMPLEX** **TYPE MO VENTURI METERS**

The City of Jacksonville, Florida installed its first Simplex Type MO Venturi Meters back in 1925. Here's what Mr. C. H. Helwick, Superintendent of Jacksonville's Water Department, has to say about those original meters:

"These two meters have required very little attention and have remained dependably accurate through the years. The capacities of the pumping stations... have been enlarged beyond the capacities of the meters, and these meters have been removed and reinstalled at new pumping stations for more years of service."

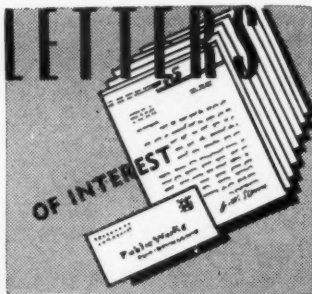
No wonder, then, when consulting engineers Reynolds, Smith & Hills undertook the plans for Jacksonville's \$7,000,000 water works improvement program, that Simplex Type MO Venturi Meters were specified as standard equipment for *all* pumping stations. For full information about MO and other Simplex meters write to Simplex Valve and Meter Company, Department 6, 6750 Upland Street, Philadelphia 42, Pa.



# **SIMPLEX**

**VALVE AND METER COMPANY**

Need more facts about advertised products? Mail your Readers' Service card now.



### **SLIDES NEEDED FOR TEACHING**

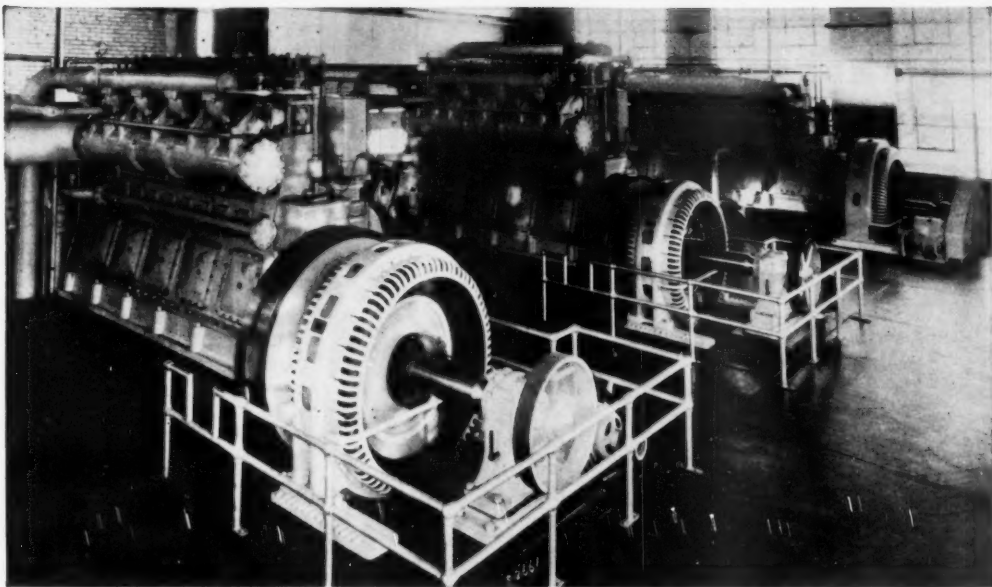
In connection with my work at the Research Bureau, I teach a course in local government at the University of Rochester. This is both an orientation course and a citizenship course, and it requires considerable compression to cover the field adequately in two semesters.

I have found it particularly difficult to cover public works for a non-engineering group and have wished many times for a set of slides that would show in some detail the various aspects of public works. I might mention, for example, a cross-section of some fire hydrant showing the provision for draining the standpipe, or the photograph of the Bullclam shown on page 8 of *Public Works* for March.

I wonder if the various companies producing public works equipment would consider it good advertising to furnish persons in my position with two-inch slides showing the details of their products. I also wonder if your magazine is in a position to feel out equipment men on this proposal.

I have tried to work up a set of slides for myself. Where it was possible for me to photograph directly on thirty-five millimeter film I have been successful. Copying line drawings or wash drawings has been more difficult. Local photographers demand up to \$5.00 apiece for making such slides although black and white slides can easily be made to sell for a quarter or less. Obviously the \$5.00 price is prohibitive.

I do not know that other teachers of local government are interested, but I believe that the availability of slides would create a demand. Courses in local government are given in some forty Universities and Colleges throughout the country and this would be the top limit for such uses. I imagine, however, that a set of public works slides would



ENGINES IN FOREGROUND ARE ORIGINAL UNITS installed in 1939. Background engine is the latest supercharged unit installed in 1950. Another supercharged unit, placed in service in 1947, is not

shown in this view. The output of this plant has increased from 952,600 kw hrs for the first year to 3,792,900 kw hrs for the year ending December 31, 1951.

## Power plant is financial asset for city of Odessa, Missouri

**PROFIT** used to pave streets, pay off water and sewage bonds, operate water department, and to pay for power plant itself.

Odessa, Missouri, is an agricultural trading center 38 miles east of Kansas City.

In 1939 the town took a big step—they started operation of a power plant that has since provided the small part-farm, part-suburban community with continuous, dependable, economical power. And equally important, it brought new income that did more than pay for power plant operation.

It also helped pave the streets, pay off water and sewage bonds,

and is paying off the cost of the new plant itself.

In spite of the high profitability of plant operation, rates have been lowered twice, and are today as low as can be found anywhere in the state.

Much of the credit for the success of the plant goes to the high operating efficiency of the four Worthington Diesels. After the two original units had been in service about eight years, the first supercharged engine was installed

in 1947. An additional supercharged unit was placed in service in 1950. Present output of the plant is 13.5 kw hrs per gallon with a load factor of 69.5%. The two supercharged engines—at this same load factor—averaged 14.0 kw hrs per gallon.

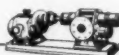
If you are interested in learning more about how modern Diesels, dual fuel, or high compression gas engines can help you reduce your power bills, write to Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Engine Division, Buffalo, New York.

E.2.3

### Worthington-Built Auxiliaries



ENGINE STARTING COMPRESSORS



OIL TRANSFER PUMPS



CIRCULATING WATER PUMPS



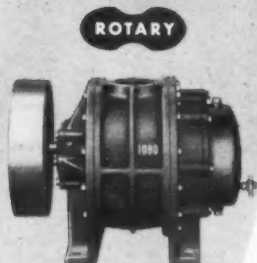
EVAPORATIVE TYPE ENGINE WATER COOLERS

**Economical Continuous Power**—Diesel Engines, 150 to 2,640 hp . . . Gas Engines, 190 to 2,880 hp . . . Dual Fuel Engines, 150 to 2,640 hp.

**WORTHINGTON**  
Engines

Now's the time to mail this month's Readers' Service card.

## For 10 CFM or 100,000 CFM ...compare blower values



Typical low-capacity R-C Rotary Positive Blower. Sizes range from 5 cfm to 50,000 cfm, permitting selection closely matched to needs.

- ☐ Choice of Rotary or Centrifugal
- ☐ Capacity matched to the job
- ☐ Easy accessibility
- ☐ Ruggedness
- ☐ Ease of installation
- ☐ Ability to handle overloads
- ☐ Long-time durability
- ☐ Freedom from breakdowns
- ☐ Low maintenance costs
- ☐ Engineering assistance
- ☐ Proved reputation of maker
- ☐ Customer satisfaction

No need to take chances when buying blowers, exhausters or gas pumps. Just put this "detector test" to work on your specific problem and you'll arrive at the most satisfactory answer.

For instance, if you're debating between Rotary Positives and Centrifugals, remember that only Roots-Connorsville builds both—the exclusive *dual-ability* line that permits unbiased recommendations. Their wide range of capacities supplies sizes and types that are quite likely to be most closely matched to your needs.

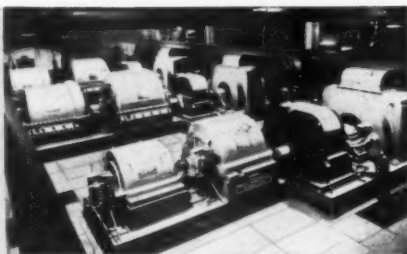
For economy of operation, reliability and low maintenance, we refer you to a list of users that dates back almost a century. If you'll rate your possible choices on a performance basis, you'll usually find R-C equipment "tops" on the list.

To help you make the most profitable, practical decision, our experience is at your service.

**ROOTS-CONNERSVILLE BLOWER CORPORATION**  
525 Poplar Avenue, Connorsville, Indiana



Six R-C Multi-Stage Centrifugal Blowers equipped with automatic regulators to provide extremely wide range of operation at various pressures and capacities.



# Roots-Connorsville Blower

A DIVISION OF DRESSER INDUSTRIES, INC.



Thousands use our Readers' Service card to keep up to date . . . do you?

be very welcome to local engineering societies and perhaps to other groups.

I hope you and the manufacturers will feel that this suggestion has sufficient advertising value to merit your and their interest.

W. Earl Weller,  
Director, Bureau of  
Municipal Research  
45 Exchange St.,  
Rochester 14, N. Y.

*Ed. Note: Will our readers who have such instructional material available, write direct to Mr. Weller? Thanks a lot.*

### A CORRECTION; OUR REGRETS

In the article on "Our Largest Airport" published in your March, 1952 issue is the following statement:

"Chicago and Cook County, with the aid of the federal government, are currently engaged in a multi-million dollar superhighway construction program."

The facts are that the cost of the expressway construction within the City of Chicago is being divided equally among the State of Illinois, the County of Cook, and the City of Chicago, and the cost of such construction outside the City is being divided equally between the State and County. Federal participation consists exclusively of such amounts as the State assigns to expressway projects from its regular apportionments of Federal aid. The failure of your statement to credit the State of Illinois with any part whatever in the expressway program constitutes, in my opinion, a most unfortunate omission.

F. N. Barker,  
Chief Highway Engineer,  
Dept of Public Works & Bldgs.,  
State of Illinois,  
Springfield, Ill.

### BOOKS IN BRIEF

#### DATA BOOKS FOR ENGINEERS

Two volumes of this valuable book, completely revised and up to date, are now available. Volume 1 covers design, contains 491 pages and costs \$10. It gives the data necessary to design, place under contract and construct nearly all types of engineering structures. The information given is necessarily condensed, but it is much to the credit of the authors that this book has been made so universally useful and

Your Community  
will accept the  
**COMMUNITY-WIDE**

# Garbage Grinder Plan

as Suggested by  
*Waste King Pulverator*

To begin the Community-wide Garbage Grinder Plan, the Public Official must first pave the way by eliminating existing obstructions in antiquated ordinances that may retard the progress of the Plan. This can be accomplished by proceeding as follows:

1. Adopt new ordinances to permit installation of garbage grinders and, when necessary, to modify existing plumbing and electrical codes.
2. Organize an educational program that will express the community's need for a Community-wide Garbage Grinder Plan. It is to be presented to the public to enlist their support for Garbage-free Living.
3. Prepare ordinances requiring the installation of garbage grinders in new and existing dwellings and in all food-preparing and food-serving establishments for the health and safety of the individual.
4. Give the public the right to choose garbage grinders by type, brand, model and features that meet with their preferences.

The public will be able to purchase their brand sold by local merchants, who provide the service, installation and coordinate local financing.



Cooperative local merchants will assist the Plan at all levels!



It's a fact . . . our handy Readers' Service card is the easy way to get new catalogs.



Progressive-minded Public Officials are joining the crusade for Garbage-free living!

On the basis of free-selection by product and free-enterprise with local merchants and businesses, the community benefits . . . *The Public Official is relieved of the grievous and burdensome liability of financing and selecting garbage grinders.*

Select groups are appointed by the Public Official to execute the Plan in its minutest detail.

Reputable manufacturers of garbage grinders should be invited by the Public Official and Group Leaders to lend assistance in every way possible. They have the experience and facilities to promote the Plan and are willing to cooperate and undertake a concentrated program in conjunction with their dealer organization.

When completed, the Community-wide Garbage Grinder Plan, as suggested by Waste King Pulverator, will end forever the age-old problem of garbage collection and disposal.

An invitation is extended to Public Officials to investigate the Community-wide Garbage Grinder Plan by writing for further information.



## GIVEN

MFG. CO.

3301 E. Fruitland  
Los Angeles 58, Calif.

Dept. PW6, Given Mfg. Co.  
1250 Wilshire Blvd., Los Angeles 17, Cal.  
☐ Please send further information on the Community-wide Garbage Grinder Plan.

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_  
Title \_\_\_\_\_

# Look! It's Really Portable—

# RIGID

## "400" POWER DRIVE

### On Wheels!



Wheel legs and front handles available to convert your present "400" to wheel model; or legs and tray to make bench model into stand.

**Power for hand threaders, cutters, reamers  
now easily rolled where you need it!**

- ★ One man can easily wheel-barrow this popular RIGID power unit close to the work—think of the time and muscle saving!
- ★ And it stands still and delivers plenty of power—universal motor, forward, reverse,  $\frac{1}{4}$ " to 2"—to 12" with geared tools.
- ★ RIGID design 3-jaw chuck, 6 adjusting pinions, one always handy; self-centering workholder in rear.
- ★ Sealed-in lubrication—no oil to spill.
- ★ See it, compare it—buy the unequalled "400" at your Supply House!

**THE RIDGE TOOL COMPANY • ELYRIA, OHIO**



Get full details of this month's new products . . . mail your Readers' Service card today.

valuable. Volume 2 covers specifications and costs, contains 506 pages and costs \$13. In addition to the kind of information most of us will welcome on specifications, there is an excellent section on costs and cost analysis. Another volume is to come. Elwyn E. Seelye is the editor and author. Published by John Wiley & Sons, Inc., New York.

#### CRSI DESIGN HANDBOOK

This book contains what you want to know about reinforced concrete, and the information is presented in a form as painless as the subject matter permits. It streamlines the process of designing reinforced concrete structures by eliminating most of the computation. Answers to complex stress and load problems are all worked out in this manual. Given load and span data, the rest is easy. Designs are based entirely on 1951 ACI reinforced concrete building code, with a couple of exceptions. 412 pages; \$5. Order from Concrete Reinforcing Steel Institute, 38 S. Dearborn St., Chicago 3, Ill. Money back if you don't like it.

#### PARKING HEADACHE

This is a report by the Cleveland (Ohio) City Planning Commission and it is a very good report, factually and in appearance. If you have downtown parking troubles (and who hasn't?) it may pay you to see what Cleveland has found and what it recommends.

#### WATER AND ITS PROPERTIES

This is an excellent small book, in three main parts: The natural history of water; the work done by water; and the utilization of water. By the late Sir Cyril S. Fox; the Philosophical Library, Inc., New York 16, N. Y.; 148 pages; \$8.75.

#### DESIGNING A STEEL BRIDGE

This gives the details of the design of a modern steel deck girder highway bridge and the application of arc welding to it. Though the arrangement is poor and hard to follow, all of the information relating to design and cost estimation is presented. 32 pages of small type, table and mathematical formulas; 76 illustrations. By Ned L. Ashton, consulting engineer, Iowa City, Ia.; published by Lincoln Electric Co., Cleveland, O. 25 cents.



# ANOTHER NEW 4 WHEEL DRIVE PAYLOADER



## MODEL HR

1 CU. YD. CAPACITY

### FEATURING . . .

- 4-wheel drive
- Rear-wheel Power Steering
- Four Forward Speeds
- Four Higher Reverse Speeds
- Hydraulic Bucket Control
- Hydraulic Down-pressure
- Automatic Tip-back Bucket



### Write for

literature on the 4-wheel drive 1 cu. yd. Model HR or 1 1/2 cu. yd. Model HM "PAYLOADER." There are also five sizes of two-wheel drive "PAYLOADERS" — 1 1/4 yd., 3/4 yd., 1/2 yd., 15 cu. ft., 12 cu. ft.

Here's the tremendous tractive ability, the mobility and the versatility of the famous Model HM "PAYLOADER" applied to this new 1 cu. yd. tractor shovel. Here's the same low, compact design . . . the same power-boosted rear wheel steering that means maximum maneuverability. And — once again — here's more than *thirty years* of tractor-shovel experience built into a single machine.

The Model HR conquers sand, snow and mud . . . works on pavement without injuring the surface . . . travels fast from job to job. It can dig tough materials, load big trucks, bulldoze, strip, excavate, stockpile, spread, lift, push and do drawbar work. There's a choice of 60 hp Diesel or 54 hp gasoline engine . . . extra attachments include bulldozer, crane hook, fork lift and snow plows.

If you want to know how much usefulness, mobility and all-around job capacity can be packed into a one-cu. yd. tractor-shovel, you have to see a Model HR "PAYLOADER" in action. Contact your Hough Distributor today. The Frank G. Hough Co., 761 Sunnyside Ave., Libertyville, Illinois.



# PAYLOADER®



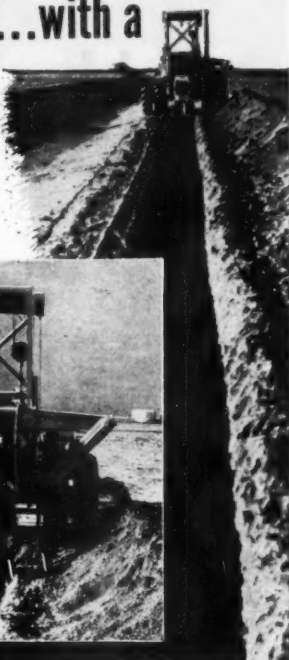
# DIG CLEANER TRENCHES...*FASTER*...with a

## BE-GE Hydraspeed TRENCHER

Mobile, maneuverable and fast, the BE-GE Hydraspeed digs trenches more profitably . . . whether you have miles of trench to dig at one location . . . or have to move from one small job to another. Self-propelled! Hydraulic controls at operator's fingertips! The exclusive Hydratrans is a positive displacement fluid motor that drives the rear tractor wheels. BE-GE's smoother operation insures cleaner trenches up to 24" wide and 5 ft. deep at speeds from 0 to 12 ft. per minute.

For full details and specifications, see your  
**J. I. CASE Industrial DEALER**  
or write direct to Dept. C  
**Be-Ge Manufacturing Co.**  
GILROY, CALIFORNIA

A Northwestern Kansas oil field pipeline contractor reports his Be-Ge Hydraspeed Trencher averaged 1,300 ft. of 34" deep, 22" wide trench per day, a lot of it in rough, rocky soil. When picture was taken his Be-Ge had dug over 160,000 feet of trench.



**BEFORE**  
... with ordinary filters



Bowser water filtration systems for swimming pools are unsurpassed for their ability to produce brilliantly clear water. They use only 1/10 the usual backwash water and occupy only about 1/10 to 1/5 the usual floor space.

Bowser operating cost is much lower, too!

Write for your copy of "The MODERN WAY to filter swimming pool water."



**BOWSER, INC., 1395 CREIGHTON AVE., FORT WAYNE 2, IND.**

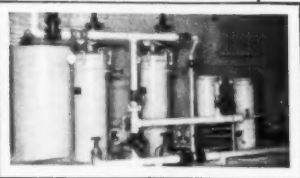
Regional Offices • Atlanta • Chicago • Cleveland • Dallas • Kansas City  
Los Angeles • New York • San Francisco • Washington, D. C. • Hamilton, Ontario

Now's the time to mail this month's Readers' Service card.

***NOW*** Sparkling Clear Water  
with Bowser Diatomite Filtration



Typical Bowser Filtration System — compact and easy to operate.





## "You Can't Fool Me On Street Sweepers!"

"I've got to have efficiency and low operating and maintenance costs—that's why I selected MOBIL-SWEEPER," says Bill Heath, president of Wm. R. Heath Co., contract sweeper for municipalities and industrial plants.

When you're competing with all other sweeping methods and equipment on a "per hour" rate, the costs of operation are doubly important. Bill Heath of Inglewood, California, sweeps on contract for paving contractors, municipalities and industrial plants. He has owned and operated nearly every type of sweeper in recent years and he says—"Mobil-Sweeper is the best machine I've ever had. Speed in traveling to and from the sweeping area is vitally important in my cost records.

Mobil-Sweeper is outstanding in this department.

"Maintenance costs have been unbelievably low. That International engine is great—the sweeper design is properly engineered. Gutter broom and rear broom are easy to adjust, and I get long wear on both. The dirt hopper always fills to capacity—something I check because it costs me money to stop too often. For my money—and I do mean my money—Mobil-Sweeper is the best buy on the market!"

Write today for literature telling how you can cut your sweeping costs.



TWO GUTTER BROOM MODEL WITH DUAL DRIVING CONTROLS

# MOBIL-SWEEPER

DIVISION OF  
THE CONVEYOR CO.  
3260 E. SLAUSON AVENUE  
LOS ANGELES 58, CALIF.

THE CONVEYOR COMPANY  
3260 East Slauon Avenue, Los Angeles 58, Calif.

Gentlemen:

Please send catalog with complete details and specifications for the Mobil-Sweeper.

Name \_\_\_\_\_ Title \_\_\_\_\_

Address \_\_\_\_\_ City \_\_\_\_\_

County \_\_\_\_\_ State \_\_\_\_\_



PW17

# EQUIPMENT DATA TO HELP YOUR PUBLIC WORKS PROGRAM

The engineering information in these helpful catalogs will aid you in Engineering and Public Works programs. Just circle numbers you want on the coupon or write the manufacturer direct and mention PUBLIC WORKS.

## Get the Facts on The Contact Aeration Process

94. Full engineering details on the submerged contact aeration process of sewage treatment, including diagrams of plant units, area requirements, operating costs and other details are available in a bulletin of the Hays Process Co., Box 768, Waco, Texas. Check the coupon to get the facts.

## Clean Cuts For Concrete and Blacktop

98. Quick, efficient cuts in pavement for repair and installation of underground utilities are easily made with the Tri-Line concrete cutter. Smooth clean edges of cuts prevents spalling of the replaced pavement. For all details on the Tri-Line cutter and double-bonded diamond blades get Form 500A from Tri-Line Co., 921 Carroll St., Racine, Wis. Just check the coupon.

## Rubber Traffic Cones for Safe Traffic Barricades

105. Safe and convenient traffic barricades can be placed quickly when you use the inexpensive rubber Traffic Cone. Flexible, wear-resistant cones are easily attached. Cones are Square-based for stability and brilliantly colored for visibility. Full details from Safety Traffic Cone Corp., 949 No. Vignes, Los Angeles 12, Calif. by checking the coupon.

## Sound Principles of Water Tank Maintenance

110. "Tank Talk", published by Dixie Tank & Bridge Co., Box 14, Memphis, Tenn., gives a step-by-step explanation of Dixie's operations, including inspection, cleaning, scaling and painting of your standpipes and elevated steel water tanks. Be sure to find out how Dixie can help you. Check the coupon today.

## Engineering Guide For Street Lighting

111. Eighty-four pages of guidance in the design of street lighting systems are presented in the Street Lighting Engineering

Guide now available from Westinghouse Electric Corp. Computations for roadway illumination and step-by-step design procedures are carefully described. For a copy of this booklet, B-2099, check the coupon or write Westinghouse Electric Corp., Pittsburgh 30, Pa.

## What Maintenance Do Your Tractors Need?

26. The life of your tractors depends largely on the maintenance you give them. Now you can get a four-color, cartoon style booklet that tells the basic methods for making Caterpillar Diesel Tractors last longer and do



better work at lower cost. Operating instructions are simply explained and proper care of tractor components is shown. Get Form 30247 by checking the coupon. Caterpillar Tractor Co., Peoria 8, Ill.

## Corrosion Protection For Buried Pipe

42. Protecting buried pipes from corrosion with "Scotch" plastic tape is described and illustrated in a new booklet. Both high speed machine and hand wrapping for water and gas mains, joints and leads are shown. Get this booklet by checking the coupon or write Minnesota Mining & Mfg. Co., 900 Farquhar St., St. Paul, Minn.

## Better Parking Is Good Business

45. Very practical and helpful advice for solving the problem of parking congestion is offered in an attractive new book that should be read by every public official. Available without charge from H. Rhodes, Inc., Hartford, Conn., the book gives specific plans for making best use of curbside parking spaces and off-street facilities. Check coupon for your copy.

## PUBLIC WORKS for June, 1952

Investigate "Tifa"  
For Insect Control

116. With "Tifa", the Todd Insecticidal Fog Applicator, chemicals are distributed as a true, clean fog. Use coupon for full data on public health programs. Combustion Equipment Div., Todd Shipyards Corp., 81-16 45th Ave., Elmhurst, N. Y.

## What Bonded Performance Can Do For You

121. On every construction job your city or county should be protected from a contractor's default or inability to perform the work. Learn what "Bonded Performance" can do for you. Write National Surety Corp., 4 Albany St., New York, N. Y., or check the coupon for full details.

## Full Design Data On Butterfly Valves

125. Full details on valve sizes, pressure ranges and operating mechanisms for Pratt rubber seat butterfly valves will be found in 82-page Catalog B-1 issued by Henry Pratt Co., 2222 S. Halsted St., Chicago, Ill. This convenient source of condensed, practical information is available to engineers and designers. Just check the coupon.

## All-Electric Floatless Liquid Level Control

174. Description of operating principles and applications of B-W controls show the simplicity and many uses of these all-electric, floatless devices. Get latest bulletin for engineering data, diagrams of typical installations and details of component parts. Check the coupon or write B-W Controller Corp., Dept. PW, Birmingham, Mich.

## MORE LISTINGS ON PAGES 29 TO 44

Clip

AND MAIL TODAY



## READERS' SERVICE DEPT. PUBLIC WORKS MAGAZINE 310 East 45th Street, New York 17, N. Y.

Please send me the following literature listed in the Readers' Service Dept. of your June issue.

### Booklets from pages 26-40:

20	21	22	23	24	25	26	27	29	30	31	32	33	34	36	39	41	42	45
46	49	54	55	57	58	59	61	64	66	69	70	75	81	86	89	94	95	97
98	99	100	102	103	104	105	107	110	111	112	116	117	120	121	123	125	126	128
129	136	137	142	147	148	150	151	154	155	160	161	162	164	166	168	171	173	174
177	181	183	185	192	197	198	201	205	207	211	213	214	215	218	220	221	224	226
228	232	234	236	238	239	240	241	250	251	253	254	256	258	263	272	277	278	280
281	286	287	288	289	290	291	292	293	294									

### New Products, pages 127-131:

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6-6	6-7	6-8	6-9	6-10
6-11	6-12	6-13	6-14	6-15
6-16	6-17	6-18	6-19	

Name .....  
Occupation .....  
Street .....  
City ..... State .....

THIS COUPON NOT VALID AFTER JULY 1952

# the Power Graders THAT HAVE EVERYTHING

## 8 Important Features Never Before Combined in a Motor Grader

30 minutes of action, in 16 mm. color and sound, demonstrating the performance of Austin-Western Power Graders and Attachments on a wide variety of jobs. Your nearby A-W distributor will be glad to schedule a print for your use.

### Precision Sideshift

which keeps  
the blade under  
perfect control.

### High-Lift Blade

for accurate work  
on any degree  
of slope.

### Extreme Blade Reach

which comes in  
handy on the  
majority of jobs.

### All-Wheel Drive

with its tremendous  
climbing power  
in the front  
drivers.

### All-Wheel Steer

which makes the  
grader twice  
as maneuverable.

### Controlled Traction

which moves  
more material,  
farther and  
faster.

### Completely Reversible Blade

for those rare  
occasions when  
it is necessary.

### Full Hydraulic Control

with its instant,  
fingertip  
action.

AUSTIN-WESTERN COMPANY · Subsidiary of Baldwin-Lima-Hamilton Corporation · AURORA, ILLINOIS, U.S.A.

# Austin Western



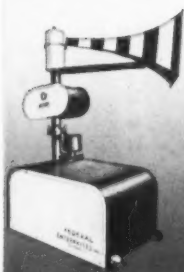
SINCE 1917 - BUILDING CONSTRUCTION EQUIPMENT



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### Handbook of Air Compressors and Air Tools

197. The complete line of LeRoi products for the construction industry, including air compressors, Tractair tractors, and air powered tools will be found in a colorful new binder of LeRoi bulletins. Details are provided on all units to help you match them to your job requirements. Check the coupon or write LeRoi Co., Dept. PW, Milwaukee 14, Wis.

### What You Should Know About Wood Preservation

287. Detailed answers to questions frequently asked about pentachlorophenol, a chemical widely used to preserve wood against decay and insect attack, are contained in a 40-page booklet available from Monsanto Chemical Co., St. Louis 4, Mo. Check the coupon today.

### Here's How To Handle Those Bulk Chemicals

22. Chemicals purchased in bulk reduce treatment costs but present a handling problem. Now, with the Link-Belt Bulk-Flo feeder, conveyor and elevator combined in one compact fully enclosed assembly your problem can be solved. Book No. 2475 has 28 pages showing installations, size selection, layouts and full engineering data for all combinations of horizontal, vertical and inclined movement of chemicals. Get your copy by using the coupon. Link-Belt Co., 307 N. Michigan Ave., Chicago 9, Ill.



### Safety on The Highway

290. A full line of safety and directional signs, illustrated in color, are featured in a new descriptive brochure issued by Eastern Metal of Elmira, Inc., Elmira Heights, N. Y. Included are details of the patented Eastern "A" stand, designed for use by highway crews of all types. For a copy check the coupon today.

### Helpful Data On Valve Boxes

291. Bulletin 35 issued by Buffalo Pipe & Foundry Co., Box 55, Sta. B, Buffalo, N. Y., gives full details on adjustable valve boxes, extension boxes and roadway boxes for water and gas. Get your copy by checking the coupon.

### New Reflectorized Sign Faces Refurbish Old Traffic Signs

292. Get complete details on new "EZ-On" traffic signs, faces ready for immediate shipments. Reflectorized faces cost only a fraction as much as new signs and are easily attached to existing traffic signs. Use the coupon for data today. Grace Sign & Mfg. Co., St. Louis 18, Mo.

### Two-Way Radio Equipment For All Departments

293. The benefits of two-way radio communication in the uncongested non-interference 450-megacycle range make full information on this subject important to all engineers. Get full data on trouble-free systems from Motorola, Inc., Dept. PW, 4545 Augusta Blvd., Chicago 51, Ill. Just check the coupon.

### Record Copy Service Fills Municipal Need

294. Many departments of municipal governments are faced at times with the job of preparing exact copies of data from their files. Now the Desigraph Photocopy service of Remington Rand Inc., 315 Fourth Ave., New York 10, N. Y., can reproduce these records for you in either same size or reduced for filing convenience. Get full data on this helpful service by checking the coupon.

## THE NEW FOSTER 50-G2

Pressure Reducing Regulator

# IS A NATURAL



It combines extremely close regulation and high inlet-to-outlet ratio, under varying loads — approaching instrument control — with the freedom from trouble, long life and easy maintenance of a regulator.

### Here's Why:

Although the new 50-G2 is single-seated for tight shut-off, it has the throttling action of a double-seated valve. Full balanced pilot valve and short travel of operating steam to the main valve piston cut the lag in response, for extremely close following of the demand. Yet over-travel, flutter and chatter are eliminated by the mass of the piston, stabilizing multi-rings, and unrestricted area under the piston.

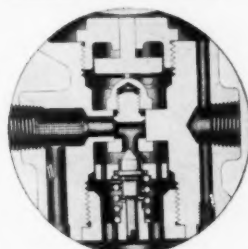
Pilot valve opening with the flow minimizes deadhead loss, and permits higher inlet-to-outlet ratio, for instance, 250# to 2#. May eliminate intermediate stage in low pressure applications such as deaerating water heaters, tank storage heaters and auxiliary exhaust systems.

All wearing parts are of stainless, corrosion and erosion resisting materials. New alloy metals mean less wear.

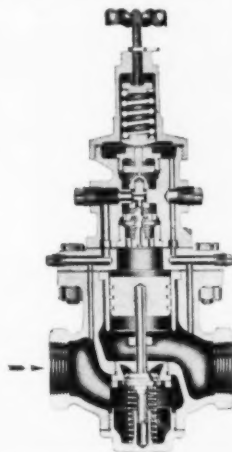
No special tools are needed for servicing, and no outside media are required for operation.

Available for initial pressures 25—1200 P.S.I.G.; temperatures to 950°F; reduced pressures from controlled vacuum of 15" HG. to 600 P.S.I.G. with minor changes in top assembly; sizes 1/2" to 12".

For full information, ask for Bulletin G-101.



50-G2 Auxiliary or Pilot Valve Unit



Foster Type 50-G2 Internal Pilot Operated Pressure Reducing Regulator with Standard Top Assembly

## FOSTER ENGINEERING

PRESSURE REGULATORS... RELIEF AND BACK PRESSURE VALVES... CUSHION CHECK VALVES  
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## FOR REPAIRING BELL AND SPIGOT JOINT LEAKS...



**SKINNER-SEAL**  
Bell Joint Clamp for  
stopping bell and  
spigot joint leaks  
under pressure. Gas-  
ket is completely  
sealed, at bell face  
by Monel Metal Seal  
band—at spigot by  
hard vulcanized  
gasket lip.

## AND BROKEN MAINS

**SKINNER-SEAL**  
Split Coupling  
Clamp. One man  
can install in 5 to  
15 minutes. Gasket  
sealed by Monel  
band. Tested to  
800 lbs. line pres-  
sure. A lasting re-  
pair. 2" to 16" incl.



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**PURE WATER**

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Fresh water in large silver fountains,  
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Great when he made war on his  
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For excellence in MODERN water  
treatment equipment—gravity  
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MECHANICAL EQUIPMENT  
BY  
**ROBERTS FILTER MFG. CO.**  
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**ROBERTS FILTER MFG. CO.**  
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### Forms to Speed

#### Sewage Plant Construction

**288.** Uni-Form panels and "V" wall forms that mean faster, more economical concrete forming for all types of wall construction are described in Bulletin SA-75 of the Universal Form Clamp Co., Chicago 51, Ill. Get your copy by checking the coupon to see how you can save time, labor and material.

### The Science of

#### Soil Sampling

**289.** A complete collection of data and information about soil sampling techniques accumulated during the past 33 years by the Acker Drill Co., Inc., Scranton 3, Pa. is presented in an interesting 16-page booklet. Just check the coupon for free copy.

## WATER WORKS

### How to Keep Trenching

#### Jobs on Schedule

**24.** The easy maneuverability of the tough, compact Cleveland Model 95 "Baby Digger" makes it well suited for the difficult job of trenching past the many obstacles of city and suburban work. Multiple digging and crawler speeds handle all soil types and trench widths up to 24". Get Bulletin S-52 from Cleveland Trencher Co., 29100 St. Clair Ave., Cleveland 17, Ohio.

### The Modern, Streamlined

#### Elevated Tank

**32.** A new 8-page bulletin describes the Watersphere, a modern elevated water tank of welded steel construction for general service gravity water pressure and fire protection. Construction details, illustrations of typical installations and table of standard sizes from 25,000 to 250,000 gallons capacity are included. Check the coupon. Chicago Bridge & Iron Co., 2115 McCormick Bldg., Chicago 4, Ill.

### Is Your City

#### Metered 100%

**33.** 100% metering as practiced by many cities requires accurate, dependable meters with interchangeable parts. Cut-away views of every part, capacity and size data are all included in handsome American-Niagara water meter booklet available from Buffalo Meter Co., 2920 Main St., Buffalo 14, N. Y.

### Quick Way to

#### Locate Leaks and Pipe

**57.** The Globe line of leak locators, dipping needles and pipe finders, Geophone leak locator, Little Wonder pipe phone, and the Magnetic Dipping Needle, described in several leaflets. Globe Phone Mfg. Corp., Dept. P., Reading, Mass.

### Bulletin Helps Specify

#### A.W.W.A. Valves

**64.** All the facts you need to know when designing, ordering or specifying A.W.W.A. valves will be found in Bulletin 106, issued by Kennedy Valve Mfg. Co., Elmira, N. Y. Detailed specifications are provided on the wide range of types, sizes, controls, accessories and connections available. Check the coupon to get this valuable reference material for your permanent file.

### Efficient Coagulation

#### With Ferri-Floc

**69.** Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick flocculation, manganese removal, control of certain tastes and odors, plus other aids in high quality water production. Check coupon for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

### Smaller Diameter Water Lines

#### Cement Lining for

**89.** Water lines from 4" to 12" diameter are now cement-lined in place by Centrine Corp., using the Tate process. Catalog C-50 tells how this operation gives new pipe performance to old lines, and shows just how the work is done. An interesting folder, well worth studying. Check coupon for your copy. Centrine Corp., 140 Cedar St., New York 6, N. Y.

### Efficient Underdrains for

#### Rapid Sand Filters

**59.** Be sure you have engineering data on glazed fire clay tile filter bottoms, designed for efficient filtering and backwashing. Check the coupon or write F. B. Leopold Co., Inc., Dept. PW, 2413 W. Carson St., Pittsburgh 4, Pa.

### Useful Data on

#### Butterfly Valves

**100.** Complete descriptions and tables of dimensions on the full line of Rockwell Butterfly Valves is contained in several bulletins published by the company. Construction details and special control features are illustrated. Write W. S. Rockwell Co., 200 Eliot Street, Fairfield, Conn.

### Tested Jointing Materials

**102.** "Hydrotite" is a self-caulking, self-sealing joint compound for bell and spigot pipes. For data book and sample write Hydraulic Development Corp., 50 Church St., New York, N. Y.

### Bulletin Helps

#### Pump Installation Design

**103.** Construction details, design, approximate dimensions and typical examples of performance of Economy double-suction centrifugal pumps will be found in 16-page Catalog A750, issued by Economy Pumps, Inc., Div. of C. H. Wheeler Mfg. Co., 19th and Lehigh, Philadelphia 32, Pa. This bulletin is profusely illustrated to show many types of pumps and methods of drive for water works service. Check coupon for your copy.

### The Modern Way to Filter

#### Swimming Pool Water

**104.** That's the title of a bulletin full of facts about Bower's new diatomite filter to produce clear, sparkling, clean water at low cost. Occupies small space, doesn't waste water. Gives sizes to use, performance charts, etc. Write Bower, Inc., Dept. PW, Ft. Wayne, Ind.

### Specs for

#### Gate Valves

**112.** Rigidly inspected gate valves for pressures up to 175 lbs. by R. D. Wood Co. Sizes 2" to 30"; for any standard type joint. R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

### Pipe Detector Determines

#### Exact Location and Depth

**120.** Determination of the exact location and depth of buried pipes, valves, service cables and other metallic objects can save costly digging and unnecessary damage. Your work can be expedited when you use the Detectron pipe detector, which features simple operation, simple to avoid static interference, economical unit construction and a lifetime guarantee. Get full data from Detectron Co., 5631 Cahuenga Blvd., No. Hollywood, Calif., by using the coupon.

### How to Tap

#### Concrete Pressure Pipe

**126.** The simple steps required in making a pressure tap in concrete pressure pipe are explained in a booklet issued by Lock Joint Pipe Company. Be sure you know how either large connections or small service outlets may be made economically and without sacrifice of strength. Just check the handy coupon. Lock Joint Pipe Co., Box 269, East Orange, N. J.

### How Your Filter Washing

#### Can Be Improved

**136.** More thorough sand washing with the elimination of mud balls and cracking with resultant longer filter runs are claimed for the Palmer Filter Bed Agitator, described in bulletins issued by the Palmer Filter Equipment Co., P. O. Box 1655, Erie, Pa.

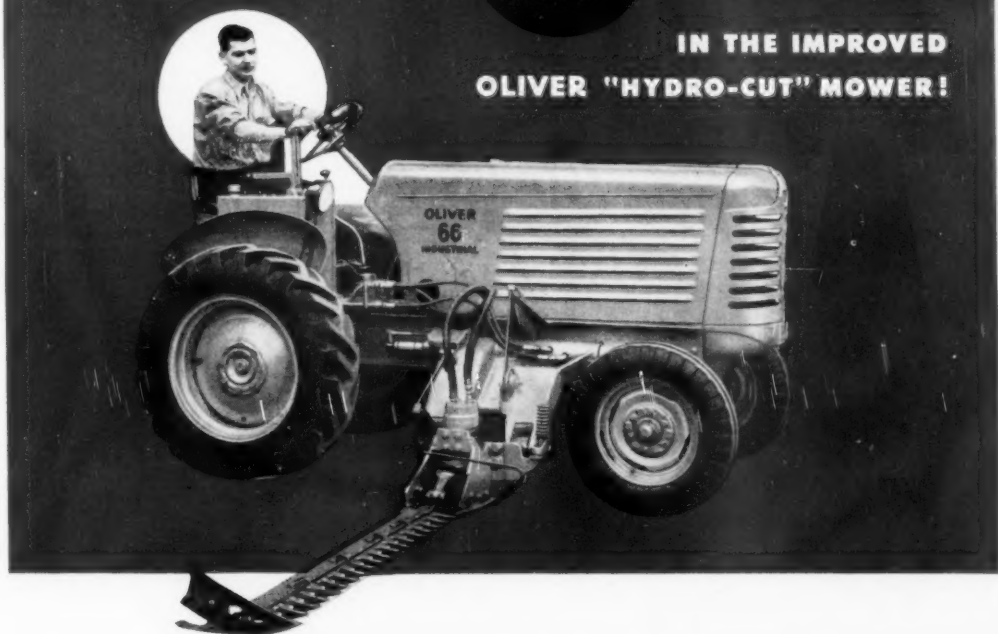
### Helpful Data on

#### Well Water Systems

**173.** A comprehensive, 48-page book on Layne Water Well Systems covers gravel well wells, underreaming, cemented wells, rock wells and other well types. Applications of shutter screens and vertical turbine pumps are shown, together with water treatment and conditioning equipment. Ten pages are devoted to useful engineering tables and measurement data. Check the coupon today or write Layne & Bowler, Inc., Dept. PW, Memphis 8, Tenn.

# We Kept the Man in Mind

IN THE IMPROVED  
OLIVER "HYDRO-CUT" MOWER!



**Operator comfort and convenience** . . . simplified maintenance . . . these were the two big things we kept in mind in the improvements we made in the Oliver "Hydro-Cut" Mower.

Actually, our performance reports showed that, from an operating standpoint, our mower was tops in its class. The outstanding Oliver features—hydraulic driven cutter bar that cuts anything from thick matted grass to moderate brush . . . hydraulic drive that assures smooth, practically vibration-free operation . . . hydraulic safety mechanism that virtually eliminates knife damage . . . finger-tip hydraulic control for instant raising or lowering of cutter bar—are retained.

But, now, we've made life easier for the operator. There is no need for frequent oilcan lubrication of the pitman. Pressure lubrication at all required moving

points is provided to eliminate need for frequent lubrication. Selective and frequent tightening of the pitman bearings is eliminated.

New hydraulic tank and controls are located for maximum operator convenience. One-piece carriage casting assures more protection for the sheaves and even further dampens vibration.

**Don't Overlook these Cost-Cutting Combinations**

A "Hydro-Cut" Mower can be quickly and easily installed in combination with a Loader, Sweeper, or Bulldozer using the same hydraulic pump to operate the combination unit.

For all the facts on the mower that really cuts mowing costs to the bone, see your Oliver Industrial Distributor or write The Oliver Corporation, Industrial Division, 19300 Euclid Ave., Cleveland 17, Ohio.

## THE OLIVER CORPORATION

A Complete Line of Industrial Wheel and Crawlers Tractors







Traffic barriers and lane channelling can be set up in 1/10 the time.



## NEW SAFETY Traffic Cones

with square base

now only

**\$1.95**

each\*

### POWERFUL STEEL-LIKE APPEARANCE . . .

#### MADE OF SAFE FLEXIBLE RUBBER

The Safety Traffic Cones steel-like appearance commands respect of motorists and pedestrians, yet is made of safe collapsible rubber. It efficiently marks proper lanes of traffic and guides motorists away from hazardous conditions.

**CAUTION:** Beware of buying products that violate existing patents. Safety Traffic Cones are manufactured and sold under Patent No. 2333273, covering Traffic Cones which offers absolute protection to the buyer against any lawsuit due to infringement. Be sure any traffic cone you buy bears Patent No. 2333273.

### COLORFUL LONG RANGE VISIBILITY FOR DAY TIME USE.

#### REFLECTORIZED BRILLIANCE FOR POSITIVE NIGHT CONTROL

The brilliant red, yellow and black color combination offers high visibility to the motorist and provides ample warning that there is danger ahead. The reflectORIZED Safety Traffic Cone provides the same positive traffic control after dark.

### NEW LOW PRICE PRODUCES ECONOMICAL

#### AND EFFICIENT TRAFFIC CONTROL SYSTEM

- Look At These Features • formulated paint reduces maintenance expense • long life • eliminates man hours formerly consumed building wire, wood and old fashioned barriers • will nest with any traffic cone marker now in use in the United States or foreign countries under Patent No. 2333273 • eliminates danger of law suits due to damage by steel and wooden safety devices • will not roll •

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Freight prepaid on all shipments over 100 lbs.  
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For further information write:

GUIDE THE MOTORIST . . . DON'T CONFUSE HIM

**SAFETY TRAFFIC CONE CORP.**

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Los Angeles 12, California

### Faster Pipe Laying With Precast and Threaded Joints

148. McWane 2" cast iron water pipe with threaded joints and precast bell and spigot pipe are described in folder WM-47. Additional data on 3" to 12" centrifugally cast pipe and fittings in folder WL-47, both issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala.

### What You Should Know

#### About Fluoridation and Fluoridators

155. Two helpful publications issued by Wallace & Tiernan titled "Fluoridation" and "Fluoridators" show the development of fluoridation, list the chemicals and dosage normally used, and give full technical data on solution feed and dry feed fluoridators. Be sure to get these publications from Wallace & Tiernan by checking the coupon today.

### Helpful Data on

#### Corporation Stops

161. A complete line of brass goods for water works: corporation stops, curb stops, service pipe couplings, goosenecks and other fittings are illustrated and described in catalog W-39, issued by A. Y. McDonald Mfg. Co., Dubuque, Iowa. Get your copy for ready reference.

### What You Should Know About

#### Meter Setting and Testing Equipment

166. Complete details on all equipment and proper methods for meter testing and installation are included in an excellent book published by Ford Meter Box Co., Waukegan, Ill. All waterworks men concerned with setting and testing of water meters should have a copy of this book. Write for Catalog No. 50.

### Pipe Joint Essentials and Couplings for Every Job

168. Superior pipe joints are tight, flexible, simple, strong and economical. Dresser's handsome 14-page bulletin No. 513 shows how these essentials are met and provides layouts for curves, working pressures and a wealth of other data. Be sure to check this bulletin on the coupon. Dresser Mfg. Div., 39 Fisher Ave., Bradford, Pa.

### Be Sure To Investigate

#### The Be-Ge Trencher

171. Municipalities and contractors both report that the Be-Ge trencher, with its fully hydraulic operation and easy maneuverability, cuts costs and brings profits on all types of trenching jobs. "Hydratrans" fluid motor delivers smooth, positive power at any speed. Digs up to 24" wide and 5 ft. deep. Hydraulically controlled backfiller blade is standard equipment. Get form 520 from Be-Ge Mfg. Co., Gilroy, Calif., by checking the handy coupon.

### On Mechanical Joint C.I. Pipe Engineering Data

183. General specification, weights and dimensions of mechanical joint cast iron pipe and fittings are furnished in a 32-page booklet issued by Alabama Pipe Co., Anniston, Ala. Get this helpful data by checking coupon.

### Installation Guide for Transite Pressure Pipe

192. A convenient, pocket-size book of 115 pages covers the whole job from receiving and handling pipe to pressure and leakage tests of finished lines. Over 100 drawings show important operations, and the text tells both how and why. Copies are available from Johns-Manville, Dept. PW, 22 E. 40th St., New York 16, N. Y.

### Technical Service Offers

#### Help on Fluoridation Planning

207. Helpful information to assist in planning new installations and improvement of existing fluoridation systems is available from General Chemical Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y. Check the handy coupon today.

### Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy. Get yours by checking the coupon.

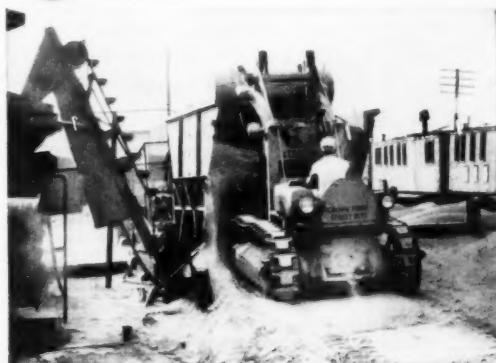




**STREET WORK...** TRAXCAVATORS dig in and get things done. Here, the City of Orlando, Florida, uses its T4 to load excess material in preparation for paving.



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■ Versatile TRAXCAVATORS earn the complete satisfaction of the taxpayer as they get the job done at rock-bottom cost.

For a small investment that is spread over many years of service, he sees hundreds of jobs vital to public welfare—new roads, better streets, improved sanitation, water and sewer lines, ice and snow control—done quickly and economically by TRAXCAVATORS.

Even with today's high prices, taxpayers know they are getting the most for their money with all-purpose TRAXCAVATORS on the job. Ask your "Caterpillar" Dealer for details on the model that can do your work with tax savings...or write direct.

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TRAXCAVATORS®  
TRACLOADERS  
PIPE LAYERS  
ANGLEFILLERS

### Insurance Benefits For Civil Employees

256. Civilian government employees are offered insurance protection at the lowest possible cost by Government Employees Insurance Companies, Gov't Employees Insurance Bldg., Washington 5, D. C. Full details available by checking the coupon.

### All About

#### Centrifugal Pumps

258. Where pumping performance counts you want to check your specifications carefully. Investigate the features of Fairbanks-Morse centrifugals. Use coupon or write to Fairbanks, Morse & Co., Dept. PW, Chicago 5, Ill.

### Does Your Water Works

#### Have Standby Power?

254. Dependable Climax power plants are ready for emergency service to insure fire protection, and can also save power costs by peak load operation. Use the coupon for full data

on Climax, 40 to 495 HP, operating on sewage or natural gas, butane or gasoline. Climax Engine & Pump Mfg. Co., 208 So. La Salle St., Chicago 3, Ill.

### Investigate This Compact Flow Meter for Water

226. The Foster "Flow Tube" is a new metering element that is compact and easy to install. Bulletin FT illustrates simple element containing nozzles for differential pressure production and shows capacity range and accuracy. Made in standard type sizes. Foster Engineering Co., Union, N. J. will send copy, or use coupon.

### Helpful Valve Catalog For Engineers

236. For complete descriptions of Darling double disc, parallel seat gate valves be sure to get Bulletin 5002 issued by Darling Valve & Mfg. Co., Williamsport, Pa. Construction details covering all valve parts and accessories are helpful for specification writers. Check the coupon for your copy.

## PUBLIC WORKS for June, 1952

### Automatic Pump Control For Your Water System

239. In Bulletin 230-64, Builders-Providence outlines the "Pressure Control" system which is said to save on first cost by providing ground level storage in residential areas; permit unattended operation of outlying stations; furnish instantaneous response to meet fire flow. Flow diagrams and typical applications are included. Mail coupon to check this versatile system. Builders-Providence, Inc., Providence 1, R. I.

### New "Chromatron" Photoelectric Colorimeter and Turbidimeter

251. The Hellige "Chromatron" features selective color filters, square and round absorption tubes, hermetically sealed photocell and automatically focused bulb to permit analysis of water and sewage using Standard Methods or any other colorimetric procedure. Full information from Hellige, Inc., 3718 Northern

### Design Data for Hardness, Turbidity, Color or Algae Removal

253. Bulletin No. 9041 published by The Dorr Co. furnishes design data on the Hydro-Treater for high-rate, upflow type treatment of municipal and industrial water supplies. 32 pages include distinguishing features of the unit, types and sizes, capacity ratings and typical operating results. Get your copy of this helpful bulletin by using coupon today. The Dorr Co., Barry Pl., Stamford, Conn.

### General Catalog on

#### Measuring and Controlling Equipment

272. The full line of Simplex equipment for the measurement and control of liquids and gases in water and sewage plant installations is illustrated and described in detail in 28-page Catalog 002. Every engineer should study the design data in this helpful booklet. Write Simplex Valve & Meter Co., 68th & Uplands Sts., Philadelphia 42, Pa., or use the coupon.

### Standard Specifications

#### for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in a convenient booklet offered with the compliments of U. S. Pipe and Foundry Co., Burlington, N. J. Get your copy by checking the coupon.

### Corrosion Protection

#### For Water Works

280. Steel pipe lines, elevated tanks, treatment plant equipment and all other steel structures subject to rust, tuberculation and attack by aggressive soils can be protected by long-lasting Bitumastic enamels. Send for bulletins today so that you can specify the right coating for your job. Use coupon or write Koppers Co., Inc., Products Div., Dept. 555T, Pittsburgh 15, Pa.

## CONSTRUCTION EQUIPMENT AND MATERIALS

### Excellent Booklet Shows Aerial Mapping Technique

27. A clear explanation of the technique of aerial topographic map production is given in "Air Speeds Your Map Needs." Striking photographs trace aerial photos step-by-step to the final maps for highway location, city and regional zoning and planning, traffic studies, drainage and watershed projects, tax maps and many other types of work. Use the coupon to get this excellent booklet for public works and planning officials. Jack Ammann, Photogrammetric Engineers, 829 N. St. Mary's St., San Antonio 2, Texas.

### Your Dump Truck As a Complete Working Unit

39. The addition of a Holmes-Owen Loader to four dump truck converts it into a complete digging and loading unit that enables one man to load, haul and dump. Illustrated folder shows how this self-loading unit with hydraulic crowding action can be a real time and labor saver for the municipality or contractor. Check the handy coupon for full data. Ernest Holmes Co., Chattanooga, Tenn.



## ...MEN AT WORK!

Beneath the surface of this undisturbed street in Washington, D. C. men are at work . . . reconditioning water pipelines with the Centrlining process. Above ground, traffic flows smoothly . . . unobstructed by the usual men, machinery and excavations.

Because the Centrlining process centrifugally applies cement-mortar lining to pipes in place, excavation time, overall costs and interruption to

street traffic are kept at an absolute minimum. Couple these advantages with the fact that Centrlining permanently prevents corrosion and tuberculation, increases carrying capacity, reduces pumping costs, gives new pipe service at a fraction of the cost of new pipes, and you have the reason why more and more city engineers and officials are specifying Centrlining for their pipeline projects.

### CEMENT-MORTAR LININGS FOR PIPES IN POSITION

2,298,688 FEET  OF EXPERIENCE

### CENTRLINE CORPORATION

A subsidiary of Raymond Concrete Pile Company

140 CEDAR STREET, NEW YORK 6, N. Y.

Branch Offices in Principal Cities of United States and Latin America

ON THE WEST COAST, WRITE PIPE LININGS, INC., P. O. BOX 3428,  
TERMINAL ANNEX, LOS ANGELES, CALIFORNIA



## Allis-Chalmers AD-40 MOTOR GRADERS

# FIRST WITH A NEW KIND OF BUILT-IN POWER STEERING

You will do more and better work, do it easily and safely with the new Allis-Chalmers AD-40 motor grader. One big reason is the new built-in hydraulic power steering system—another Allis-Chalmers first in the motor grader field. The AD-40 is specifically *designed* to use this advanced system which retains the accuracy and roadability of mechanical steering . . . and adds the ease and smoothness of hydraulic steering. What's more, the hydraulic power steering unit is *inside* the head. What's more, a short shaft to eliminate "spongy" steering. And hydraulic lines are enclosed in the frame . . . fully protected from external damage. See what HYDRAGUIDE®, the outstanding new power steering system, does for you on these jobs . . .

**See your Allis-Chalmers dealer  
for the full story**



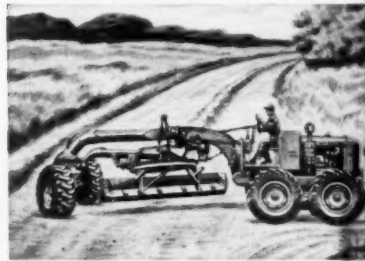
**plowing snow** — The AD-40's hydraulic system makes steering easy even with the added front-end weight of a plow.



**muck, sand, soft ditches** are back-breakers no longer. With hydraulic power, you pilot the wheel . . . not wrestle it.



**ditching**—Hydraulic power does most of your steering work, lets you cut right up to culverts, etc. before turning out.



**turning around** is easier. You can turn the AD-40's wheel from side to side . . . even while standing still.



**bank sloping**—Power steering gets you into position much easier...without tiring "wheel fight" you've known before.



**holes and bumps** cause no "wheel kick" because the hydraulic system cushions shock. You turn only when you want to.

*the Newest, Finest line on Earth...*

# ALLIS-CHALMERS

TRACTOR DIVISION — MILWAUKEE 1, U. S. A.

### Handbook of Contractors Pumps Is Easy to Use

49. Big 50-page Catalog P-10 covers de-watering pumps, pressure pumps, well point systems and electric pumps, and also features a special section of useful data which helps in the selection of the right pump for your job. Every construction engineer and contractor should have a copy of this valuable handbook. Just check the coupon. The Jaeger Machine Co., 400 Dublin Ave., Columbus 16, Ohio.

### Municipalities Make Equipment Dollars Go Further

55. Be sure to get your copy of "Saving Facts" a new illustrated booklet prepared by The Oliver Corp. that shows how equipment dollars can be stretched on municipal work. Text and photos describe the application of tractors and money-saving attachments in street maintenance, snow removal, waste disposal, pipe laying and other projects. Write The Oliver Corp., Industrial Div., 19300 Euclid Ave., Cleveland 17, Ohio, or check coupon.

### Examining a Tractor Piece by Piece

99. The new 32-page catalog published by International Harvester Company should be studied by every tractor owner, for in it each unit from engine to track of the TD-9 Diesel is considered separately. These piece by piece discussions are supplemented by notes on repair servicing, versatile applications and attachments for every need. Get your copy of form C.M. 313-A from International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., or check the handy coupon.

### Helpful Booklet on Carryable Centrifugal Pumps

129. A booklet prepared to give practical information that will guide you in choosing the best type of pump for your requirements is offered by the Homelite Corp. Both gasoline and electric models are discussed, and requirements outlined for many applications. Just check the coupon for your copy. The Homelite Corp., 2125 Riverdale Ave., Fort Chester, N. Y.

### Handy Catalog Covers Complete Tractor and Grader Line

70. A new 20-page booklet in a handy pocket size features Allis-Chalmers complete industrial tractor line. The importance of wise buying and fitting the equipment to the job is emphasized. Don't miss your copy. Use coupon today. Allis-Chalmers Mfg. Co., Tractor Div., Box 512, Milwaukee, Wis.

### Be Sure to Investigate The Gledhill Grader

117. For economical maintenance of streets and highways, be sure to check the advantages offered by use of the Gledhill grader, product of the Gledhill Road Machinery Co., Galion, Ohio. For complete specifications on several models, just check the coupon.

### Air Cooled Engines for Hundreds of Applications

137. Tested under severest conditions of long, hard use, these engines have earned world wide recognition as the "right" power for hundreds of applications. Get latest bulletin from Dept. PW, Briggs and Stratton Corp., Milwaukee 1, Wis.

### Versatile Maintainer Has Year 'Round Usefulness

151. A new bulletin shows how the sturdy Huber Maintainer will work for you the year 'round on maintenance jobs, berm leveling, road planing, bull-dozing, snow plowing, brooming, mowing shoulders and as a patch roller. Good ideas on how to do all these jobs in Bulletin No. M-138. Write Huber Manufacturing Co., Dept. PW, Marion, Ohio.

### Not Sure You Need A Hydrocrane? Just See What One Can Do!

185. In one of the most appealing bulletins we have seen there are over 100 illustrations showing the versatile, all-hydraulic Hydrocrane performing dozens of different jobs. You could keep one busy with digging, trenching, backfilling, cleaning catch basins, loading and unloading, hoisting and erecting, materials handling, placing pipe, and on many other applications. For the full story of this mobile, truck-mounted machine just check the coupon today. Bucyrus-Erie Co., South Milwaukee, Wis.

### Handbook of Castings For All Public Works Construction

220. Every type of construction casting needed by engineers and contractors in the public works field will be found in a 136-page catalog issued by Neenah Foundry Co., Neenah, Wis. Detailed illustrations and complete tables of dimensions will help the designer and materials buyer. Get your copy of this valuable catalog by checking the coupon today.

### Get Tough Blades and Cutting Edges For Your Construction Equipment

221. Controlled analysis steels used in Shunk blades and cutting edges for graders, scrapers, dozers, and snow plows means long life and wear resistance to give you more value for your maintenance dollar. Full data for ordering blades and scarifier teeth for standard and special equipment is available from Shunk Mfg. Co., Bucyrus, Ohio. Check the coupon today.

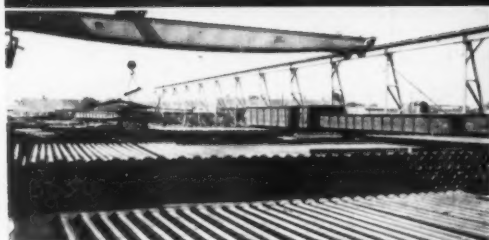
### Surveying Instruments— Basic Tools for the Engineer

228. Be sure you get Bulletin 1052 of David White Co. when you need transits, levels and other top-quality surveyors gear. A full line of surveying instruments and accessories is described in their 42-page catalog. Get your copy by checking the coupon or write to David White Co., 315 W. Court St., Milwaukee 12, Wis.

### Solving Hauling and Lifting Problems

286. Handling pipe, hydrants and valves; form pulling; equipment lifting; and many other jobs that require a light-weight, economical crane can be solved with the versatile Pitman Hydraulic Lift, an inexpensive crane that fits on the frame of any truck, 1½ tons or larger. Full data by checking the coupon. Pitman Mfg. Co., 300 W. 79th Terr., Kansas City, Mo.

## Prompt Shipment CAST IRON PIPE



Pipe Foundry Shipping Yards at McWane Cast Iron Pipe Co., Birmingham, Ala.

Shipping Yards Pacific States Cast Iron Pipe Co., Provo, Utah.



## IF YOU'RE IN A HURRY, PHONE McWANE-PACIFIC

Prompt, quick shipment by rail or truck now is available from our stock yards of McWane-Pacific DeLavaud Centrifugal Cast Iron Pipe in sizes 4" and larger, 18' lengths.

Furnished either tar coated or cement lined and you may have your choice of open-bell Bell-and-Spigot, precast Bell-and-Spigot, or Mechanical Joint. The Federal Government has recently placed Cast Iron pressure pipe and fittings under building materials category and your former 45-day limitation on pipe inventory has been changed to allow inventory based on practical working requirements. For quick shipment, telegraph or telephone our nearest Sales Office.

### McWANE Cast Iron Pipe Company Birmingham, Ala.

Pipe Sizes 2" thru 12"

#### Sales Offices

Birmingham 2, Ala. .... P. O. Box 2601  
Chicago 1, Ill. .... 333 North Michigan Ave.  
New York 4, N. Y. .... 80 Broad Street  
Kansas City 6, Mo. .... 1006 Grand Avenue  
Dallas, Texas. .... 1501 Mercantile Bk. Bldg.

### PACIFIC STATES Cast Iron Pipe Co. Provo, Utah

Pipe Sizes 2" thru 24"

#### Sales Offices

Provo, Utah. .... P. O. Box 18  
Denver 2, Colo. .... 1921 Blake Street  
Los Angeles 48, Cal. .... 6399 Wilshire Blvd.  
San Francisco 4, Cal. .... 235 Montgomery St.  
Portland 4, Oreg. .... 501 Portland Trust Bldg.  
Salt Lake City. .... Waterworks Equip't Co.



# Take Your Pick of Performance

In the complete Fairbanks-Morse Pump Line you can pick the pump that best suits your ideas of performance, efficiency, capacity, head, initial and operating costs. Whatever your choice, you can be sure it will more than live up to your expectations . . . it's Fairbanks-Morse.

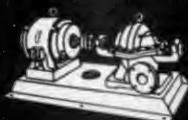
For complete information, call your Fairbanks-Morse pump expert or write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.



**FAIRBANKS-MORSE,**

*a name worth remembering*

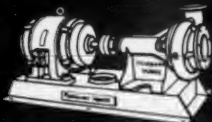
PUMPS • DIESEL LOCOMOTIVES AND ENGINES  
ELECTRICAL MACHINERY • SCALES • HOME WATER SERVICE EQUIPMENT  
RAIL CARS • FARM MACHINERY • MAGNETOS



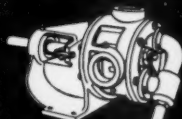
Two-Stage Centrifugal Pumps  
Capacities: 100-560 G.P.M.



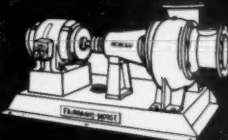
Built-together  
Centrifugal Pumps  
Capacities: 5-1000 G.P.M.



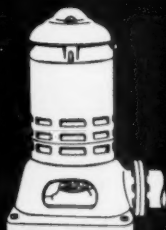
Base-Mounted Centrifugal Pumps  
Capacities: 25-3000 G.P.M.



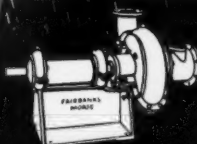
Frame Constructed  
Rotary Pumps  
Capacities: 1.3-450 G.P.M.



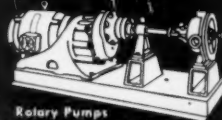
Horizontal Angle Flow Pumps  
Capacities up to 100,000 G.P.M.



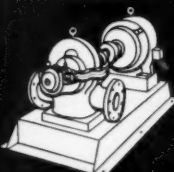
Deep Well Turbine Pumps  
Capacities: 15-25,000 G.P.M.



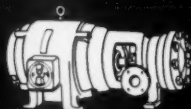
Paper Stock Pumps  
Capacities up to  
2500 G.P.M.



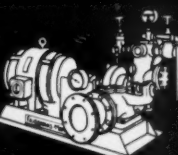
Rotary Pumps  
With Geared Head Motor Drive  
Capacities: 20-450 G.P.M.



Split-Case Centrifugal Pumps  
Capacities: 50-50,000 G.P.M.



Two-Stage Built-together Pumps  
Capacities: 5-1000 G.P.M.



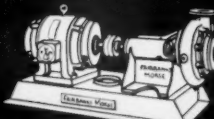
Centrifugal Fire Pumps  
Capacities: 500-2000 G.P.M.



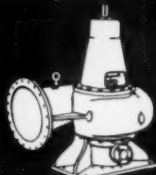
Vertical  
Propeller Pumps  
Capacities:  
1250-216,000  
G.P.M.



Bladeless Impeller  
Feed Handling Pumps



Sewage and Trash Pumps  
Capacities: 50-20,000 G.P.M.



Vertical Angle Flow Pumps  
Capacities up to  
100,000 G.P.M.



### Profitable Construction with Payloader

234. A comprehensive, 12-page catalog filled with on-the-job photos showing a wide variety of earth-moving, material-handling, lifting and carrying jobs being performed by the multi-purpose tractor-shovels known as "Payloaders" is now available. Helpful job data, specifications and features of the complete Payloader line are included, with illustrations of useful accessories. Copies of this colorful catalog No. 217 can be obtained from The Frank G. Hough Co., 761 Sunnyside Ave., Libertyville, Ill., or by checking the coupon.

### Tractor-Mounted Backhoe Simplifies Digging Operations

238. Be sure to investigate the new Henry Backhoe to cut digging costs on laterals footings, septic tanks, graves. Easily attached to your tractor. Get full data from Henry Mfg. Co., 1752 N. Clay St., Topeka, Kansas, by using coupon.

## CIVIL DEFENSE

### Get the Facts on

#### Air Raid Sirens

86. There's more to be considered in air raid warning sirens than the loudness of the signal. Get complete information on efficient size and spacing of sirens from Federal Enterprises, Inc., 8733 So. State St., Chicago, Ill., by using coupon.

### Emergency Chlorination and Main Sterilization

213. Get data on portable emergency chlorination units designed to save time in cases of broken mains or substitute water supplies. Use coupon to order copies of publications 22-C; 58-C; and 408 from Wallace & Tiernan Co., Newark 1, N. J.

### New Air Raid Siren Is Independently Powered

58. The new Chrysler Air Raid Siren, powered by a 180-hp engine to make it independent of vulnerable central power systems, may be remotely controlled if desired. Warning signal is said to be clearly recognized over a diameter of 8 miles. For complete information, specifications and availability write Marine and Industrial Engine Div., Chrysler Corp., 12210 E. Jefferson Ave., Detroit 31, Mich., or check the coupon.

### Are You Ready Now To Make Main Repairs?

214. Broken water mains can quickly be repaired when you have "Skinner-Seal" Split Coupling Clamps on hand. Get Skinner Catalog 41 now—this handsome 40-page book shows how to make every type of pipe repair and obtain a complete line of clamps to do the job quickly and easily. Just check the handy coupon for your copy. M. B. Skinner & Co., So. Bend 21, Ind.

### Auxiliary Electric Power For Public Utilities

254. Full descriptive information on Onan electric plants for every public utility need will be found in Form A-292 issued by D. W. Onan & Sons, Inc., Minneapolis 14, Minn. Be sure you have latest data on standby plants and controls for emergency electric power. Check the coupon now.

## JACK AMMANN PHOTOGRAMMETRY IS HELPING OTHERS . . .



**SOLVING A TRAFFIC PROBLEM IN NEW ENGLAND** A crisscrossed network of roads and streets, many dating back to revolutionary days, created an aggravated traffic problem in a congested Rhode Island area. The location and design of an expressway to meet tomorrow's needs is now being met with Jack Ammann topographic maps.



**RECORD-KEEPING-SYSTEM MAPS FOR INVENTORY AND PLANNING PURPOSES OF A LONG ISLAND UTILITY** 5832 base maps by Jack Ammann are making the job easier for the Long Island Lighting Co. The maps were at a scale of 1"=100 ft.; 1"=200 ft.; and 1"=800 ft.



**FOR DEVELOPING A STRIP MINE IN TEXAS TO SERVE ONE OF THE NATION'S LARGEST INDUSTRIES** A new industry in Texas, vital to defense, is using aerial photographs and topographic maps for development and strip operations to produce lignite, which in turn is used to generate power.



**PLANNING ENGINEERING OF NEWLY ANNEXED AREAS OF KANSAS CITY** A year ago Kansas City turned to Jack Ammann to supply aerial photographs, mosaics and topographic maps of 25 square miles of newly annexed areas for tax, planning, engineering and zoning purposes. They have again turned to us for 8 additional square miles for the same purpose.



**LOCATING AND DESIGNING AN EXPRESSWAY IN THE SOUTH'S LARGEST CITY** With Houston becoming the South's largest city and America's second-ranking seaport, traffic problems developed. To meet their growing problem they turned to Jack Ammann Photogrammetric Engineers for aerial photographs and topographic maps for the location and design of an expressway.

### JACK AMMANN PHOTOGRAMMETRY CAN HELP YOU, TOO

Tell us your problem. We are prepared to meet your needs anywhere. Without obligation we'll show you how we can be of profitable help.

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EASTERN OFFICE 32 WILKINSON • P. O. BOX 815 • PHONE 7/3440  
MANHATTAN, N. Y.

## PEST CONTROL

### Latest Information

#### On Effective Insecticides

198. Complete information on proper application and formulations of Chlordane and other effective insecticides for fly and mosquito control is available from the Velisol Corp., 330 E. Grand Ave., Chicago 11, Ill.

### Effective Rat Control

#### For Dumps

263. Rat infestations in public dumps can be effectively controlled with the weatherproof steel "Rat Cafeteria" offered by Solvitt Chemical Co., Inc., Speedway Road, Madison 5, Wis. Warfarin and bait are kept available for continuous feeding without wastage. Check coupon for full details.

## REFUSE COLLECTION AND DISPOSAL

### A Working Plan for

#### Community-Wide Garbage Grinding

30. In a descriptive booklet "Community-Wide Garbage-Free Living" a sound working plan is outlined for the installation of garbage grinders to eliminate the headaches of garbage collection and disposal, yet at the same time relieving the public officials of difficult financing problems. Get your copy from Given Mfg. Co., Dept. PW, 1250 Wilshire Blvd., Los Angeles 17, Calif. Use the coupon today.

### 20 Questions and Answers On Sanitary Landfill

75. The advantages of sanitary landfill, factors in site selection, kind and size of equipment needed, capacity of a given site and other important engineering considerations are discussed in Form 1084 prepared by the Trackson Co., Dept. PW, Milwaukee 1, Wis. Check the coupon for complete information on this refuse disposal method.

### How Load-Packers Reduce Refuse Collection Costs

123. The sequence of operation for fast loading and refuse compression in the Gar Wood "Load-Packer" is illustrated and described in 8-page folder M 69, which also provides size data and details of hydraulic equipment. Be sure to check all features of the efficient Load-Packer system. Chevrolet Gar Wood Industries, Wayne Div., Wayne, Mich.

# The **DEMPSTER** Rubbish Collection System

*Eliminates*  
**DISEASE** *Carriers*



THREE STAGES of quick pick-up, hauling and dumping are shown while Dempster-Dumpster is at work in Nashville, Tennessee.



In a single year rats cost an estimated \$2 billion in damage to food, property and human life in the U. S. These disease carriers settle most commonly within a few feet of conventional garbage cans behind your business establishments, schools, grocery stores, etc. With rat-proof, scavenger-proof Dempster-Dumpster Containers, you can eliminate rats at rubbish accumulation points . . . keep rubbish completely out of sight at all times . . . and cut your collection costs in half at the same time! One truck-mounted Dempster-Dumpster, with only one man, the driver, picks up, hauls and empties a multiple number of these big containers, one after another. Without question, the Dempster-Dumpster System is the most sanitary method of bulk rubbish collection ever devised. Manufactured exclusively by Dempster Brothers, Inc.

One Dempster-Dumpster Services All Containers  
... All Designs. . . All Sizes



**DEMPSTER BROTHERS, 962 Dempster Building, Knoxville 17, Tennessee**

Now's the time to mail this month's Readers' Service card.



**INVISIBLE ARMOR** ©

You **FARE** better when your contractors are bonded by National Surety Corporation. You require successful bidders to have

- F**inancial stability
- A**bility
- R**eputation
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So do we!

And you can depend upon it that when you accept the bid of a contractor bonded by National Surety Corporation, you have two-way protection—a fully qualified contractor whose performance is bonded by one of America's leading corporate sureties.

**NATIONAL SURETY CORPORATION**  
4 Albany Street, New York

### Investigate This Plan

#### For Garbage Elimination

164. A new presentation, written especially for municipal officials, offers a modern solution for the garbage disposal problem. Be sure you have this up-to-date information on the elimination of city garbage collection by the use of Hotpoint Disposall units. Check the coupon now. Hotpoint Disposall Department, 5600 West Taylor St., Chicago 44, Ill.

#### Increasing the Efficiency of

##### Bulk Rubbish Collection

177. Strategically spotted bulk containers can be handled by one man operating a Dempster-Dumpster equipped truck. Get full details of this cost-saving system of rubbish collection, as used by many cities to increase efficiency and eliminate unsanitary conditions. Write Dempster Brothers, Inc., 952 Dempster Bldg., Knoxville 17, Tenn., or use the handy coupon.

#### Save Garbage Collection

##### In Defense Housing

181. Defense housing projects won't drain manpower for garbage collection when Westinghouse Waste-Away Food Waste Disposers are installed in each kitchen. Helpful information for community planners is offered by Westinghouse Electric Corp., Electric Appliance Div., Mansfield, Ohio. Just check the coupon.

#### An Incinerator Necessity

213. Recuperators featuring individual replacement of the heat transfer elements (silicon carbide tubes) for maximum accessibility and efficiency are described and illustrated in Bulletin 14 (issued by Fitch Recuperator Co., Dept. PW, Plainfield Nat'l Bank Bldg., Plainfield, N. J.).

## SEWERAGE AND WASTE TREATMENT

### What You Should Know About

#### Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter blocks, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, 54 Editor, Public Works, 310 E. 45th St., New York 17, N. Y. Check the coupon and we will forward your request.

#### Valuable Booklet on Porous

##### Diffuser Plates and Tubes

21. A helpful 20-page booklet published by the Norton Co. is a complete guide for the selection of porous media for installation in activated sludge plants. Full data for the designing engineer is provided by careful detailing of physical characteristics of plates and tubes. Maintenance of porous media also is discussed at some length. For your copy of Form 1246, write to the Norton Co., Dept. PW, Worcester 6, Mass., or use the coupon.

#### How Cities Clean Sewer Lines

##### From Street in One Operation

23. In a helpful 28-page handbook of sewer cleaning methods and equipment the makers of OK Champion sewer cleaners give full details of power and hand operated models. Also included are data on expansion buckets that take dirt from sewer to street in one operation, root cutters and other accessories. Get your copy by checking coupon. Champion Corp., 4752 Sheffield Ave., Hammond, Ind.

#### Water Level Controls for

##### Sewage and Water Plants

31. Dependable float-operated pump and motorized valve controls for single or multiple pump installations are described in bulletins issued by the Water Level Controls Div., Healy-Ruff Co., 719 Hamden Ave., St. Paul 4, Minn. All units feature splash proof construction, mercury tube switches.

#### Packaged Sewage Treatment—

##### Just Right for Small Places

36. "Packaged" Sewage Treatment Plants specifically developed for small communities—100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 2348 Wolfram St., Chicago 18, Ill.



This entrance shaft at intersection of Broadway and 12th Streets, Columbus, Georgia, is the only evidence that a new sewer is being installed under a busy street.

## Picture of a sewer crossing the street

There is little evidence that a sewer was being installed under this busy street. No torn-up pavements, barriers, or "Street Closed" signs. And merchants were enjoying normal business.

The answer is that the sewer was tunneled under the street with Armco Liner Plates. This made it unnecessary to interrupt traffic or business. Instead, a few workmen with Armco Tunnel Liner Plates were able to handle the job easily and economically. Even bad weather would not have hampered the work schedule.

Armco Liner Plates are strong, yet one man can easily carry, hold and bolt a section into place. No special equipment is required and there is no need to replace expensive pavements when the job is finished.

Let us tell you more about the greater safety, convenience and economy of using Armco Liner Plates for underground construction. Write for complete data. Armco Drainage & Metal Products, Inc., 1052 Curtis St., Middletown, Ohio. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.



UNDER THE STREET are workmen installing Armco Liner Plates. Work goes smoothly, quickly. Lightweight plates are easy to bolt into place.

### ARMCO TUNNEL LINER PLATES





### Durable Gratings and Treads Are a Good Investment

147. Gratings for walks around settling tanks and other parts of treatment plants, both out-doors and in, for stairways, floors and balconies, are described in an illustrated 16-page bulletin by Irving Subway Grating Co., 50-53 27th St., Long Island City 1, N. Y.

### Low Cost Power From Dual Fuel Engines

154. Operating on the Diesel cycle, burning either oil or gas, the Worthington Supercharged Dual Fuel Diesels give high economies by running on the cheapest fuel available. Get complete data from Worthington Corp., Dept. PW, Harrison, N. J.

### A Handbook of Sewer Cleaning Equipment and Methods

46. A new, fully illustrated 40-page booklet shows every sewer cleaning operation with "Flexible" tools. Includes data on the fast and

easily operated new SewerRodeR and full engineers' specifications for power bucket machines. For your copy write Flexible Sewer Rod Equipment Co., 9059 Venice Blvd., Los Angeles 34, Calif.

### How You Can Dispose Of Sewage Solids

54. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Dept. PW, Nichols Engineering and Research Corp., 70 Pine St., New York 5, N. Y.

### Forms for Every Concrete Pipe Shape

95. In addition to this a complete line of forms for standard concrete sewer and drainage pipe, special forms for varied shapes of every type are listed in the Quinn Concrete Forms Catalog. Copies available by checking the coupon, or write direct to Quinn Wire and Iron Works, 1621 12th St., Boone, Iowa.

### How to Dig Low Cost Trench Under All Conditions

61. The Barber-Greene Runabout ditcher features hydraulic control of crowding speed, independent of bucket line speed, to provide maximum digging efficiency under all soil conditions. One-man operation and mobility from job to job result in trenching at the lowest cost. Get Bulletin 705-A now for full details on this money-saving machine. Barber-Greene, Aurora, Ill.

### Helpful Design Data For Sewage Ejectors

81. The applications and advantages of pneumatic sewage ejectors are outlined in a new bulletin of the Blackburn Smith Mfg. Co., Inc., Hoboken, N. J. Included are piping diagrams for electrode and float switch controls plus dimensions and layouts for single and duplex systems. Get your copy by checking coupon.

### Construction and Engineering Service For Water and Waste Systems

97. In addition to their nationally-known water and sewer system rehabilitation services, the Pittsburgh Pipe Cleaner Co., 133 Dahlem St., Pittsburgh 6, Pa., is now prepared to furnish complete engineering and construction service, including surveys, tests, design and construction. A full and concise description of these services will be found in an attractive new folder. Get your copy by checking coupon.

### End Root Problems With Root-Proof Sewers

107. Troubles caused by roots and corrosion in house connections can be eliminated by the use of root-proof Berman sewer pipe. Full details on this smooth, waterproof, tight-sealing pipe available by checking the coupon, or write to the Brown Co., Dept. PW, 150 Causeway St., Boston 14, Mass.

### Engineering Data on Digester Heating

128. An excellent 32-page bulletin covering all features of the PFT External Heater and Heat Exchanger unit discusses effective digester heating, size of heater and exchanger, space requirements, building heating, and related items. Curves and tables provide full data for the designer. Requests for this comprehensive bulletin, No. 235, must be sent on business letterhead. Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

### Data Offered On Mixed Flow Pumps

201. Data on the complete line of Worthington Mixflo pumps of the two-vane, non-clogging sewage type is offered in 16-page bulletin W-317-H16. Salient features are outlined, typical sections, performance curves and general data for five types are included. Helpful charts aid shafting selection. Copies available by using coupon or from Worthington Corp., Harrison, N. J.

### Efficient Blowers for Activated Sludge Plants

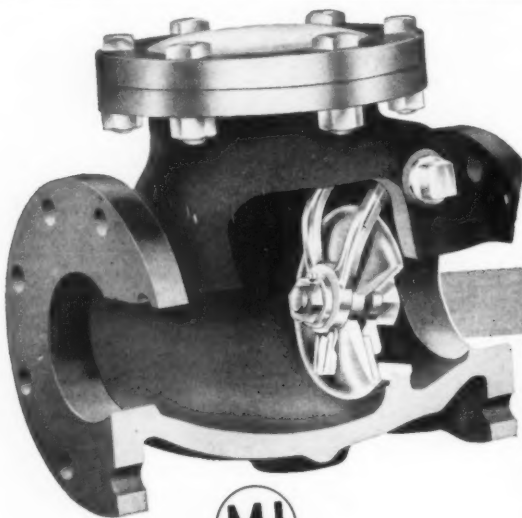
222. Many advantages of Roots-Connersville positive displacement rotary blowers are described in Bulletin 22-23-B-13, which also provides characteristic curves for operation with constant speed, multi-speed and variable speed motors and details of several types of blowers. Get this helpful bulletin by checking the coupon. Roots-Connersville Blower Corp., Connersville, Ind.

### Sound Film Shows Sewer Cleaning During 1951 Flood Disaster

250. A sound film tracing the work done during the disastrous 1951 flood in Kansas City by Ace Pipe Cleaning Contractors, Inc., 2003 Indiana, Kansas City, Mo., is available to city officials without charge. Check the coupon for full details on how you can secure this professionally prepared film showing complicated sewer main cleaning operations.

### How to Dispose of Sewage and Industrial Sludges

281. Get full information on the C. E. Raymond System of combined incineration and sludge drying providing high temperature deodorizing or nuisance-free sludge disposal. Flexible layouts fit large and small communities. Use handy coupon or write Combustion Engineering-Superheater, Inc., Flash Dryer Div., 200 Madison Ave., New York 16, N. Y.



## CHECK VALVES

Cutaway view above shows how disc is mounted on clapper arm. Disc facing is bronze or rubber. Seats are bronze. M & H Check Valves may be installed in horizontal or vertical position. Disc swings entirely clear of waterway and will not stick in open position. Two bosses on each side may be tapped for bypasses and two bosses on bottom may be tapped for draining.

Furnished with flanged, screwed, hub, mechanical joint or Universal end connections. Flanged check valves can be furnished with outside lever and weight or outside lever and spring. Both the weight or the spring are adjustable for positive and easy opening and closing, and to minimize slamming and banging of the disc.

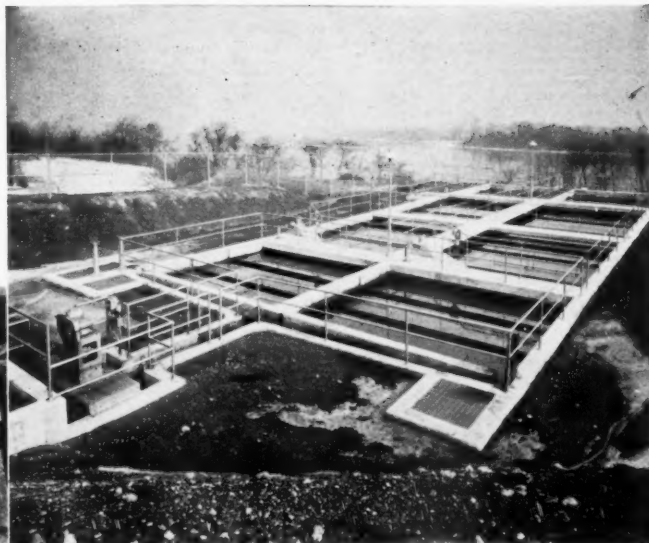
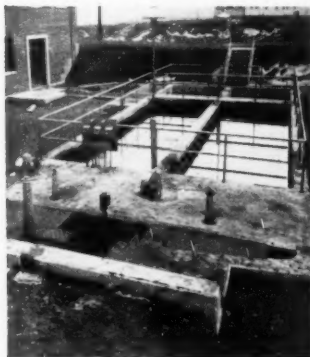
Underwriters and Associated Factory Mutuals listed and approved. Complete information on request. Write or wire M & H Valve and Fittings Company, Anniston, Alabama.

## M & H PRODUCTS

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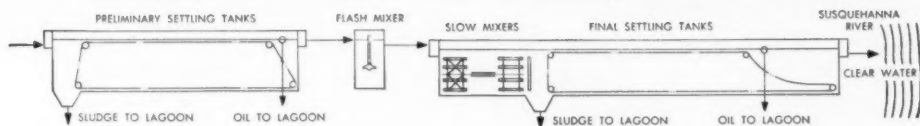


Settleable solids and floating oils are separated in the two 9 x 52 x 6 ft. preliminary settling tanks by L-B Straightline Collectors and Rotoline Skimmers.



Link-Belt flash mixer intimately mixes alum and lime for flocculation. Slow mixing is performed by two L-B mixers, parallel to the flow, whose speed is varied by P.I.V. Variable Speed Drives. Two final settling tanks, 18 x 90 x 8 ft., also have L-B Straightline Sludge Collectors and Rotoline Skimmers.

## How to halt stream pollution



**Completely LINK-BELT-equipped waste treatment plant removes oil and suspended solids at world's largest freight classification yard**

COOPERATING with Pennsylvania's Clear Streams Program, the Pennsylvania Railroad recently completed an efficient waste treatment plant at their Enola (Pa.) yards. Designed by Gannett, Fleming, Corrdy & Carpenter, Inc., consulting engineers, the plant is laid out for an average flow of 2.0 mgd, with a 4.0 mgd maximum storm flow.

To separate efficiently the solids and oils resulting from locomotive washing, ash quenching, sanitary sewage and storm water, surface loading is carefully controlled. At design flow, the preliminary tanks are limited to 2140

gal. per sq. ft. per day . . . the final tanks to 260. Sludge and oil removed are lagooned.

Whether it's for a compact industrial waste plant or a large metropolitan water or sewage treatment works, you'll find it pays to rely on Link-Belt equipment. Our sanitary engineers will work with your consultants and chemists — help you get the best in modern water, sewage or industrial liquids treatment.

**LINK-BELT COMPANY:** Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12,588-A

**LINK-BELT**  
SANITARY ENGINEERING EQUIPMENT

### Vacuum Filters Feature Easy, Non-Clog Operation

241. Get full data on vacuum filters using double layers of continuous coil springs that insure continuous, non-clog operation. Coils are automatically cleaned at each revolution. Komline-Sanderson Engineering Corp., Peapack, N. J.

## STREETS AND HIGHWAYS

### How the Mobil-Sweeper Can Improve Street Sweeping

23. Sweeping costs can be cut with the new Mobil-Sweeper which features safe highway speeds up to 55 mph, carries 2 2/3 cu. yd. dirt hopper, sweeps swath up to 10' wide with full floating brooms. Hills and deep gutters are no obstacle. Write to The Conveyor Co., 3260 E. Slauson Ave., Los Angeles 58, Calif. or use coupon for complete details on this machine.

### Levels Sidewalks and Curbs Quickly and Easily

29. How the Mud-Jack Method for raising concrete curb, gutter, walks and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a new bulletin by Koehring Company, 3026 W. Concordia Ave., Milwaukee 10, Wis.

### How to Beat The Weed Problem

66. Be sure to investigate weed control with selective chemical weed killers that get roots and all. Send in coupon today for bulletins on Dolge products that will rid roadsides, parks and lawns of the weed nuisance. C. B. Dolge Co., Dept. PW, Westport, Conn.

### Do You Have Complete Black Top Equipment Data?

41. In 36-page catalog AA a full line of equipment for black top road construction and

maintenance is covered. Units described and illustrated include several models of pressure distributors, supply tanks, sprayers, brooms, asphalt kettles, portable rollers, and accessory tools. Use coupon for copy of this handy manual. Littleford Bros., 452 E. Pearl St., Cincinnati 2, Ohio.

### Get Data Now On This Catch Basin Cleaner

34. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self-powered truck mounted unit. Netco Div., Clark-Wilcox Co., 118 Western Ave., Boston 34, Mass.

### How to Save Time on Curb and Gutter Work

143. Every type of curb and gutter work is illustrated in the 12-page Heltzel catalog on steel forms for building concrete curbs, gutters and sidewalks. Time-saving setups show how to speed up the job and save money. Get your copy from Heltzel Steel Form & Iron Co., Dept., PW, Warren, Ohio.

### Black-Top Paver Offers Many Advantages

150. The flexible Admum Black Top Paver lays any asphalt mix, hot or cold, in widths from 6 ft. to 13 ft. Careful design lowers operating cost and cuts maintenance. Attachments spread stone, cinders or slag. Get full data on this machine by checking coupon. The Foote Co., 1954 State St., Nunda, N. Y.

### Manual on Retaining Wall Design

160. Embankment stabilization with Armo Bit-Type Retaining Walls is discussed in a 16-page illustrated booklet offered by Armo Drainage and Metal Products, Inc., Middletown, Ohio. Included are case histories which show embankments along highways, lakes, streams and city streets. Technical data covers selection of design and units required for various sections, curves and grades. Use the handy coupon.

### How You Can Improve Your City's Street Cleaning

162. The Austin-Western Model 40 sweeper features three wheel design, front wheel steer, for easy maneuvering; rear broom to sweep dirt and refuse directly into 2-yd. hopper; built-in flushing device. Diagrams showing all operations and full specifications in Bulletin AD-2042, issued by Austin-Western Co., Aurora, Ill.

### Fast Marker for Traffic Guide Lines

205. Free-floating, adjustable paint shields on the Mark-Rite Econo-Liner follow surface contours and produce sharp lines in any width from 2" to 6". The machine is said to paint 10,000 to 15,000 feet of line per hour. For details write Universal Mfg. & Sales Co., 5211 Pacific Blvd., Huntington Park, Calif., or use the coupon.

### Permanent Street Signs Cut Maintenance Costs

218. Permanent cast aluminum street signs and markers of all types are described in a 20-page illustrated bulletin available from Lake Shore Markers, 654 W. 19th St., Erie, Pa. Get full information on these distinctive markers, available in plain or reflectorized finish, by checking the coupon.

### Helpful Data on Distributors For Bituminous Materials

240. Two models of pressure distributors featuring uniform pressure and temperature, accurate displacement pumping and fast loading are covered in Bulletin RS 31549 and RS 12046, available from Standard Steel Works, Dept. PW, North Kansas City, Mo. Check the coupon to request your copies.

### Heating, Thawing and Melting With Hauck Burner Equipment

277. A helpful 16-page bulletin covers the complete line of Hauck heating and melting equipment. Data covers units for every water, sewer and street department purpose, from "one-man" burners to large size portable kettles. For a useful addition to your reference file, get Bulletin 1068 from Hauck Mfg. Co., 117-127 Tenth St., Brooklyn 15, N. Y.

**HOW YOU CAN GET NEW PIPE EFFICIENCY**

**FOR 15% OF THE COST OF LAYING NEW PIPE**

24" Main before clean-24" Main after clean-  
ing (C valve 69) ing (C valve 134) Coater in 24" main 24" Main after coating

**THE PITTSBURGH-ERIC PROCESS FOR RECONDITIONING — 3" TO 24" WATER MAINS IN PLACE**

**FAST:** Up to 1000 feet of pipe can be cleaned and lined in ONE DAY

**EASY:** Corporation cocks, valves and fittings do not have to be removed. The pipe can be cleaned and lined even though corporation cocks extend through the wall of the pipe.

**CONVENIENT:** Customers can be supplied with water at all times, if desired, while reconditioning work is going on. Under other conditions, the speed of application keeps inconvenience to users at a minimum.

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**LOW COST:** Depending on the area, the cost of reconditioning by the Pittsburgh-Eric Process is only 25 to 40% of the cost of laying new pipe.

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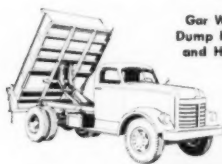
## Gar Wood LOAD-PACKERS

- To Cut Refuse Collection Costs
- To Improve Public Health

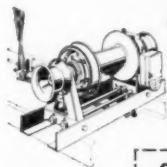
Gar Wood Load-Packers have reduced refuse collection costs for more than 1600 users (including cities of all sizes and small towns). Not only are costs cut to a minimum . . . but the Load-Packer has also proved best for promoting municipal cleanliness and public health.

Among the important features of the Load-

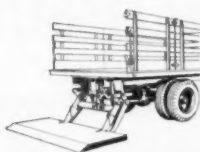
Packer are: (1) faster loading, (2) completely enclosed body, (3) low loading hopper, (4) push button operation, (5) compression loading for maximum loads and fewer trips, (6) fast, clean dumping, (7) reduced maintenance. See for yourself why the Load-Packer is by far the most popular refuse collection unit. Use the coupon below . . . today.



Gar Wood  
Dump Bodies  
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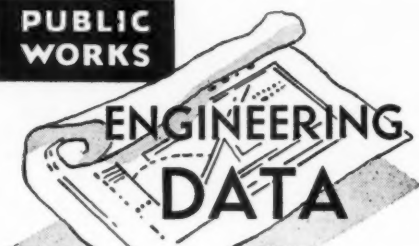
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**Cost Summary on 6-inch Water Main  
Construction in Toledo**

A summary of the costs of constructing 6-inch water service mains in Toledo, O., during 1950 and 1951 has been forwarded us by George J. Van Dorp, Commissioner of Water and Paul Kiel, Division Engineer. The summary covers 18 jobs, totaling 14,819 ft. of main, and averaging 823 ft. per job. The costs per foot given below includes hydrants, valves, tapping sleeves, connections, valve chambers and other necessary appurtenances. The mains are installed by Division of Water Construction crews, while the Engineering Section prepares the plans and provides inspection, testing and servicing.

The total cost of the lines was \$72,713.92, of which materials amounted to \$38,542.89. Thus materials represent 53% of the costs while labor, engineering, pavement replacement, supervision, etc., represent 47%. The average cost per foot for completed line was \$4.07. Average cost on lines less than 500 ft. long was \$6.57 per ft.; on lines 500 to 1,000 ft. long the cost averaged \$5.17 per ft.; and on lines more than 1,000 ft. long the average cost was \$4.07 per ft.

The cost of engineering services on these lines amounted to \$2,845.97 or 3.91% of the cost of construction. With an allowance of 10% additional for overhead, the average cost of engineering services on these lines amounted to 4.3%.

• • •

**Chlordane, BHC, Lindane for  
DDT-Resistant Bugs**

Tests conducted during the past year in heavy mosquito breeding areas of Florida and California by the Bureau of Entomology and Plant Quarantine have shown mosquitoes to be definitely more resistant to DDT, but not noticeably resistant to such newer insecticides as chlordane, lindane and BHC. DDT has been used extensively in these areas since it first became available about 1945 and the resistance build-up has been gradual; it is possible that mosquitoes may eventually develop a resistance against the newer insecticides also, especially those with a long lasting toxic effect.

For area-wide control programs, the entomologists of the Bureau recommended more dependence on permanent control methods, as drainage and filling. They also urge less extensive use of chemical insecticides for larvae control when it is practical to direct efforts also against adult mosquitoes. The reason is that it appears resistance builds up more rapidly when the insecticides are used on larvae than when they are used against adults. If used against larvae, most of the insecticide-susceptible insects are killed,

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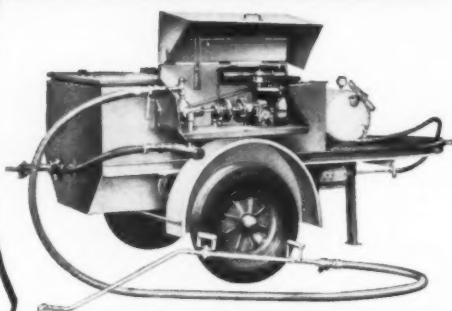
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## CONSIDER THE LENGTH OF SERVICE



## LITTLEFORD 84 HD Kettle for MAINTENANCE



When purchasing an item for a particular job, we all want to get value for our dollar. Something that is the best, will last long and give service. The same is true when buying a Kettle for Road Maintenance work, value is what City, State & County Highway Departments and Contractors are looking for. This Littleford 84-HD Kettle is an item that gives value for every dollar invested. The 84-HD gives years of service without spending additional money in repairs. Many 84-HD Kettles have been in service for 20 years or better. That's why Littleford can say "consider the length of service" when buying a Kettle. Patented Features have made the 84-HD the low cost operating unit in addition to its sturdy, efficient, and long life. Why purchase anything but the best in Black-Top Maintenance Equipment, invest your dollar wisely and get a Littleford 84-HD Kettle.



## LITTLEFORD

LITTLEFORD BROS., INC.  
452 E. Pearl St., Cincinnati 2, Ohio

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with the consequence that insecticide-resistant mosquitoes make up a high percentage of those surviving. This increases the chances that a resistant mosquito population will be built up rapidly. Control efforts, using the long-lasting insecticides, directed against adult mosquitoes in the immediate vicinity of homes and communities may provide satisfactory control with less opportunity for the development of resistant adult mosquitoes.

### Rising Lake Levels Threaten Michigan Highways

Lakes Michigan, Huron and St. Clair have risen to record high water levels and are threatening to undermine and destroy state highways built near their shores. Waves crashing against the shore undermine the higher banks and bluffs which then cave into the water. If sections of lakefront highways are destroyed, even though these sections are relatively short, extensive relocation of long stretches would be necessary in many cases. So far, the Michigan State Highway Department has spent about \$300,000 constructing jetties and placing rock at threatened areas.

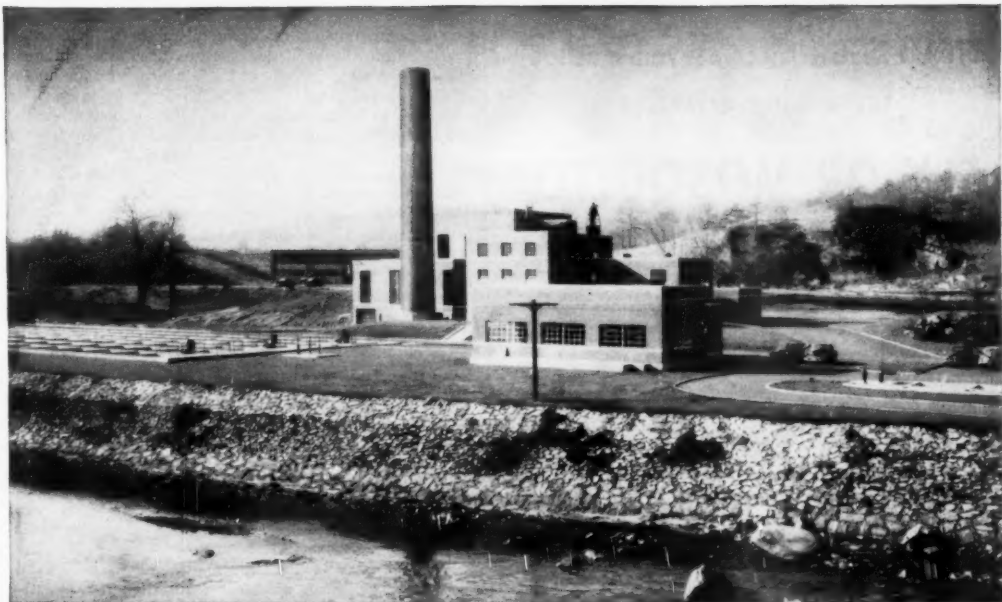
A jetty consists of a wooden wall carried on piles driven into the beach at the water's edge and running parallel to the beach, plus similar structures run out into the lake 80 to 100 feet, generally at right angles to the shore structure. The height above water is about 18 ins. These jetties break up the force of the waves and also tend to cause deposition of sand which forms an additional protective barrier. Such jetties installed south of St. Joseph two years ago have been successful in stopping beach erosion there.

Other methods used successfully have included dumping large stone along the shore, placing riprap to prevent erosion, and building timber sea walls. On the upper Peninsula, where the shorelands are low and sandy, the problem seems to have been solved by placing heavy stone riprap.

### Origin and Destination Surveys

The primary purpose of an origin and destination study of any area is to gain a knowledge of traffic movements within, through, into and out of the area as a guide in developing traffic arteries and other transportation facilities to their greatest efficiency at a minimum of cost. The counting of traffic passing given points has long been recognized as inadequate—the trip movements of the vehicles must be known, and the most practical way to obtain this information is from the vehicle drivers.

Various methods of obtaining this information have been tried—surveys of families through school children, by interviewing workers, drivers on the highways or at parking places, drivers crossing concentric cordon circles, and home interviews. The last came to be accepted widely as the most-comprehensive, but is expensive and time consuming and furnishes data concerning a comparatively small percentage of vehicles. Different investigators report the cost of home surveys as \$1.30 per interview in cities of less than 200,000 population with 10% sampling, to \$2.10 for populations of over 300,000. In 1947 the Ohio Highway Planning Survey developed a post-card method. The following year,



## New Waterbury Disposal Plant ... flash dries sewage sludge

A large forward step in lowering pollution in Connecticut's Naugatuck River was taken when the city of Waterbury opened its new disposal plant recently. Combining refuse incineration with sludge disposal and high temperature deodorization, the Waterbury plant effectively disposes of wastes for an equivalent population of 100,000.

The C-E Raymond Flash Drying Unit in this new plant is designed to dry over 29 tons of filter cake per day. This is equivalent to an evaporation rate of 2600 pounds per hour. The plant is designed so that the sludge can be dried and marketed as fertilizer, or incinerated to a sterile ash.

The Waterbury plant is typical of C-E Raymond System installations, now in service in virtually all parts of the country, meeting the varying requirements of both large and small communities. They are flexible in layout, highly efficient and thoroughly reliable; they provide for maximum utilization of waste heat.

The services of C-E specialists are available to assist you in finding the best solution to your sludge disposal problem. Get in touch with the C-E office nearest you for prompt attention.

B-561

C-E Raymond Flash Dryer Systems installed, under construction or on order since 1945

BALTIMORE, Md.	SAN DIEGO, Calif.
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WATERBURY, Conn.



**COMBUSTION ENGINEERING—SUPERHEATER, INC.**

1315 North Branch Street

Western Office: 560 W. Sixth, Los Angeles 14, Calif.

**FLASH DRYER DIVISION**

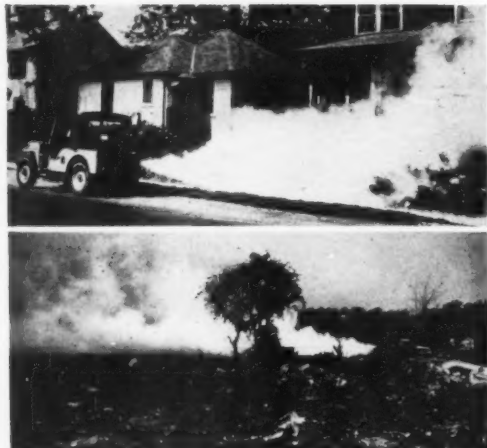
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Eastern Office: 200 Madison Ave., N. Y. 16, N. Y.

**ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT**

Now's the time to mail this month's Readers' Service card.

## TIFA FOGGING . . . proved method for a more effective FLY OR MOSQUITO CONTROL PROGRAM



TIFA is in use throughout the world in the fight against insects . . . in health programs, at public gathering places, resorts, homes, garbage and fill dumps, ranches and farms.

Prepare now for the Summer insect invasion of your city.

TIFA, Todd Insecticidal Fog Applicator, is the most effective method of killing flies, mosquitoes and other flying pests, thus helping to prevent typhoid, dysentery, diphtheria, polio and malaria from spreading in your community.

TIFA spreads a clean, chemical fog—economically and quickly—gets into even the smallest crevices. INSECTS CAN'T ESCAPE IT!

The TIFA unit is compact and portable—powered by its own gasoline engine. TIFA is constructed for easy one-man operation.

TIFA carries the Underwriters' Listing Seal. Write now for complete details of this proved fogging method.



**TODD INSECTICIDAL  
FOG APPLICATOR**

Carrying Underwriters'  
Listing Seal

**COMBUSTION EQUIPMENT DIVISION**

**TODD SHIPYARDS CORPORATION**

81-16 45th Ave., Elmhurst, Queens, N. Y.

Canadian Distributors

Spramator Limited, 1099-1105 York St., London, Ont.

Insectifog Unlimited, Lindsay Bldg., Winnipeg

West Virginia adopted the method. In this system, the names and addresses of all motor vehicle owners within the selected cordon area are obtained from the state motor-vehicle license bureau, and a self-addressed prepaid post-card questionnaire is mailed to each. This requests him to list all trips, by addresses of origin and destination, made by his car on the day after his receipt of the card. This supplements the accepted practices of interviewing all traffic leaving the area on an average day, counting traffic movements at strategic locations within the area, and those crossing a screen line within the area.

### Preliminary Publicity

An important feature of the post-card method is a preliminary publicity through the newspapers and other mediums, explaining the reasons for the survey, and how vehicle owners are personally interested in furnishing the information to be used as a basis in planning improved traffic conditions on routes used by them. An additional benefit of publicity was the greater interest taken by the citizens at large in the resulting plans and the greater probability of their being adopted and executed. In two post-card surveys made in Ohio, 55.0% of the cards sent were returned in one, 60.6% in the other. The cost of cards, printing, addressing and processing and postage was \$15.58 per 1,000 population. It was estimated that home interview surveying including 10% of the cars would have cost \$38.96 per 1,000 population, but would have obtained data from less than one fifth as many vehicle owners. The home interview, however, obtains information other than vehicular origin and destination.

Ohio finds that the success or failure of such a survey depends on: 1. Well-organized publicity; 2. properly zoned study area; 3. carefully pre-zoned cards; 4. preparation of a good zone-and-street directory; and 5. a well-selected screen line.

### State Experiences

The Planning Division of the State Road Commission of West Virginia reports that "We in West Virginia think that the so-called controlled post-card method, as it was developed by Ohio, and as we applied it, is a reasonably good method and furnished more than its money's worth in information."

New York State has employed a combination of the driver interviews and post-card methods in 49 of the 60 traffic surveys conducted during the past four years. Questionnaire postal cards were used exclusively. Each driver entering the city, or the inner cordon near the central area, between 7:00 AM and 7:00 PM on a summer Tuesday or Thursday received a card on his initial trip, and a colored instruction card requesting his cooperation in returning the card. Of over 1,000,000 cards distributed, 34% were returned. Press and radio publicity seems to have accounted for some returns. An interesting feature of the percentage of cards returned was the variation by time of day; 46% of the cards handed out at 9:00 AM, were returned, after which the percentage fell to about 30% at noon and to 27% at 7:00 PM.

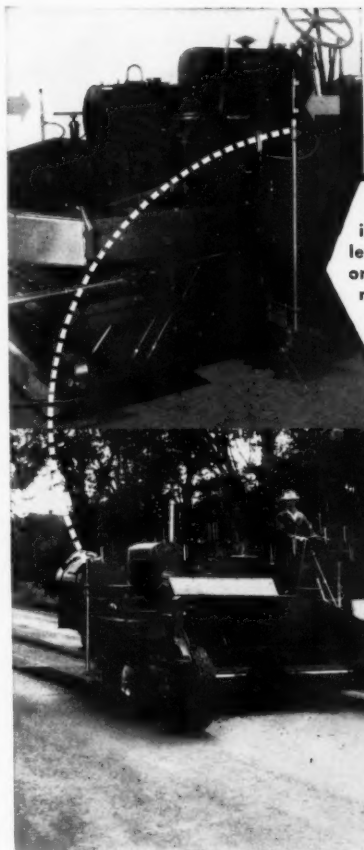
The above information is abstracted from Bulletin No. 41 of the Highway Research Board "Traffic Surveys by Post Cards."

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Reading  
Glass  
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## Positive Leveling Control for Black Top Paving!

- Level up old road perfectly and positively
- Correct accurately for any slope at any station
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- Blend new level shoulder into old crown

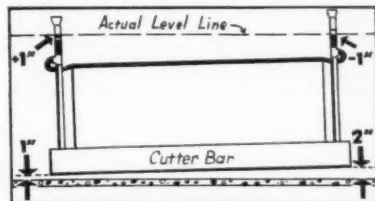
NOW, for the first time in the history of black top paving, it is possible to lay a level surface over old road and *hold it* level accurately and positively. The new Adnun Liquid Level combined with the direct lift feature of the Adnun Cutter Bar Screed has made this a certainty. The Adnun Liquid Level permits following fluctuations in grade, visually. Mechanical adjustment on the direct lift Cutter Bar Screed permits instantaneous or gradual corrections to hold the bubble in the level at the desired setting for an absolutely level surface.

You can bring wavy old roads with reverse slopes to "level". You can build dipping shoulders up to level and blend them into old crown. You can correct, accurately, for any slope at any station.

Only a Black Top Paver with a screed having a straight lift can do this. Adnuns make new roads out of old. They do things other pavers won't do. Remember, the important result is a good road. Ask for details.

Above: Roads of this type are becoming an increasing problem to Highway Departments. They can be leveled with Adnuns.

Below: Diagram of Liquid Level set to lay course 1" at shoulder and 2" at crown. This could be reversed to build up undulating or broken down shoulder.



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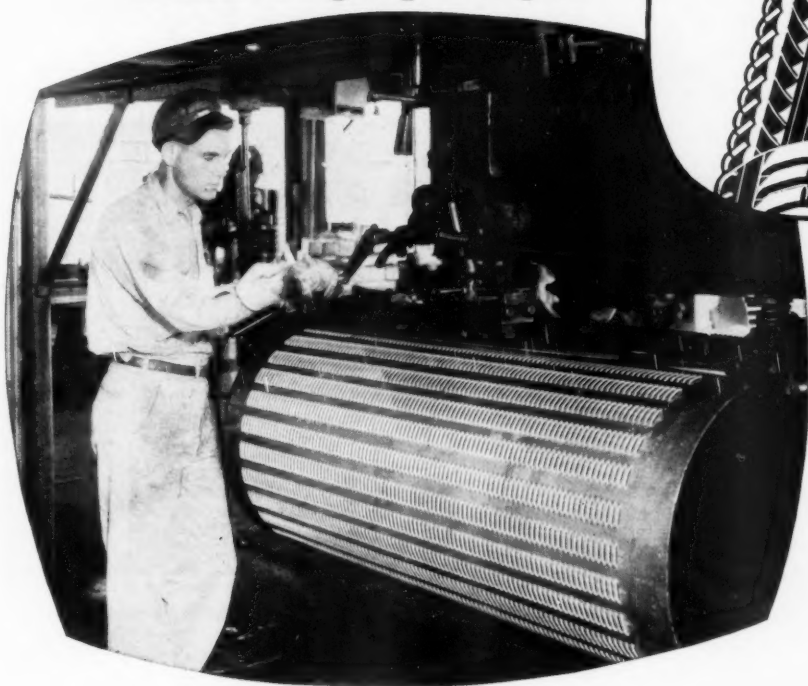
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- True sanitation for your town.

**AND . . . IT SAVES YOU MONEY!**

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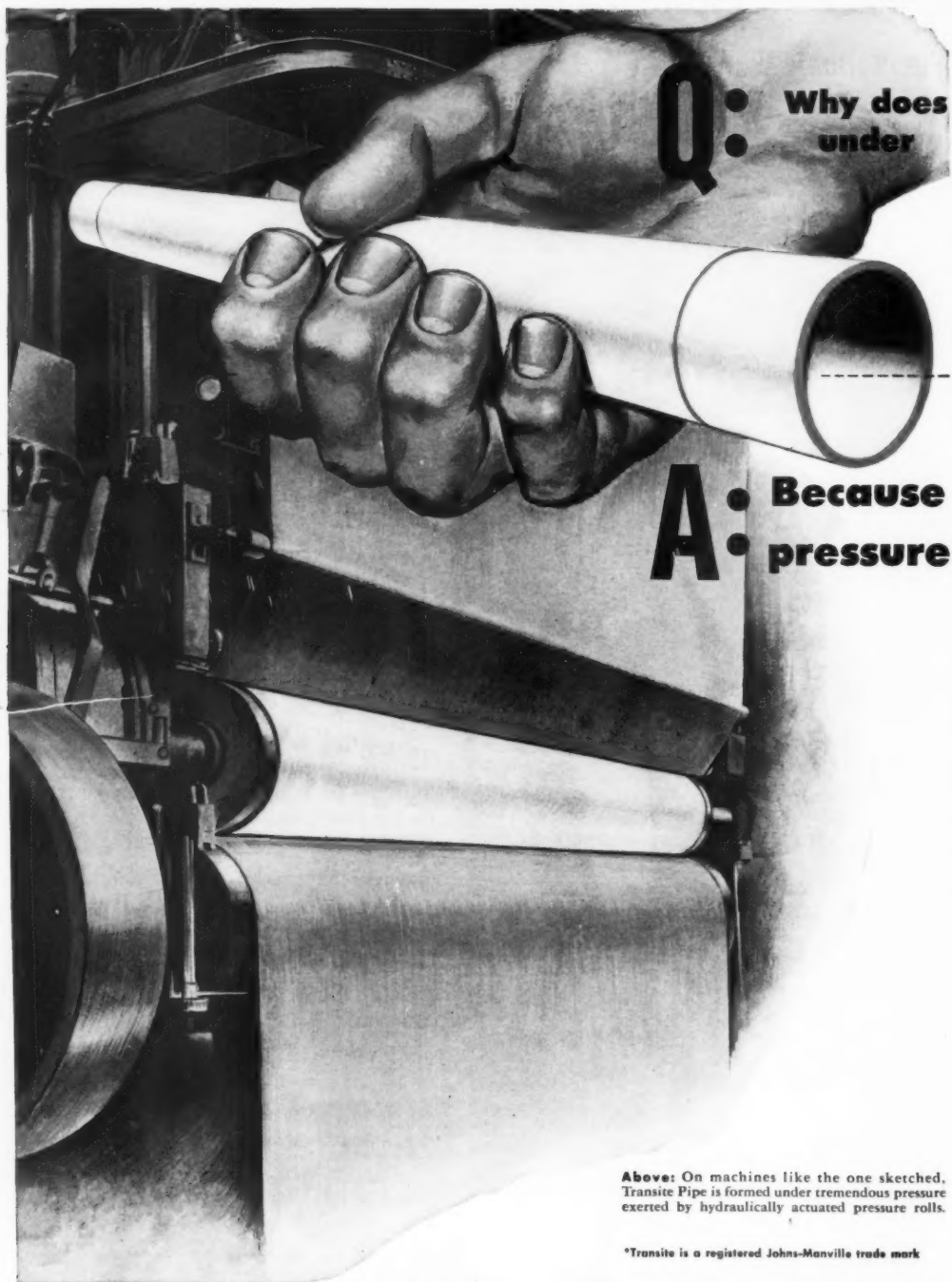
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**Q:** Why does under

**A:** Because pressure

**Above:** On machines like the one sketched, Transite Pipe is formed under tremendous pressure exerted by hydraulically actuated pressure rolls.

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The water system in this fast-growing Texas city is a tribute to the lasting strength and corrosion resistance that enable Transite Pipe installations to outlast other pipe under busy city streets. The first Transite mains were installed here in 1939 to replace previously used pipe which had a service life of approximately seven years. So successful was this original installation that today, virtually the entire supply and distribution system consists of Transite mains.



## it's formed under tremendous for lasting strength

Yes, it's the all-important quality of *lasting strength* that enables Transite\* Pressure Pipe to stand up under conditions highly adverse to ordinary pipe—as typified by the Texas city installation shown in the photograph above.

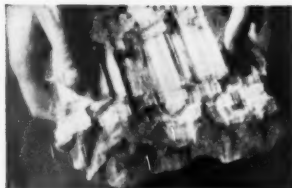
One of the reasons why Transite Pipe has this exceptional ability is the process used in its manufacture.

On specially designed pipe-forming machines, the materials that go into its making—asbestos, cement and silica... are consolidated under heavy pressure into a tough, dense homogeneous pipe wall structure. And reinforcing this structure... distributed uniformly throughout each length of pipe... are countless indestructible fibers of asbestos with a tensile strength comparable to that of steel. No wonder this modern asbestos-

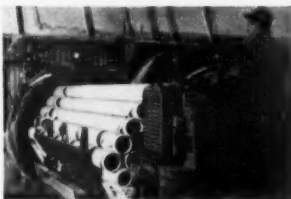
*cement pipe is strong and stays strong through the years!*

And no wonder thousands of American cities and towns have found it the answer to today's need for a pipe that assures the greatest possible return on waterline investments. For in addition to those economies resulting from lasting strength, Transite Pipe also provides other important savings. Its light weight and easy handling reduce installation costs. Its tight, flexible Simplex Couplings cut down on costly leakage losses. Its smooth interior assures a high coefficient of flow ( $C=140$ ) and, because Transite cannot tuberculate, helps keep pumping costs permanently low through the years.

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Tough, strong asbestos fibers reinforce Transite Pipe—contribute to its exceptional corrosion resistance and lasting strength.



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# asbestos-cement PRESSURE PIPE



# HYDROHOE Cuts Trenching Move-Up Time by 40%

With the smooth extend-retract action of its telescoping boom, the fully hydraulic Bucyrus-Erie Hydrohoe cuts move-up time on trenching as much as 40 percent. Operator begins cut with boom extended to full "out" position. As he trenches he retracts boom, digging right up to the back of truck. This dragshovel earns extra dollars digging, while conventional units are moving up.

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162H52



The new Bucyrus-Erie Hydrohoe gives you not one, but two digging actions: 1. Conventional dragshovel digging arc. 2. A separate horizontal action by means of telescoping the boom.



By actual measurement this Hydrohoe, digging at an approximate depth of 4 ft., cuts an 11-ft. long trench — without a single move-up.



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# HYDRAULICS OF SEWERS

*This is one of a series of John R. Freeman lectures presented under the auspices of the Boston Society of Civil Engineers.*

**S**EWERS are classified as sanitary or separate sewers if they are designed only for sanitary sewage; storm drains if they are designed only for storm water run-off; or combined sewers if they are designed to carry both sanitary sewage and storm water run-off. A sewer has two main functions: (1) to carry the maximum discharge for which it is designed; and (2) to transport suspended solids in such a manner that deposits in the sewer and odor nuisances therefrom are kept to a minimum. (Camp, T. R., "Design of Sewers to Facilitate Flow", Sewage Works Journal, Jan. 1946, p. 3.) Both of these functions are important for sanitary sewers and for combined sewers but the suspended solids transport function is of relatively less importance with storm drains. Nevertheless, higher velocities are required to transport the silt and sand in surface run-off than are required to transport the solids in purely domestic sanitary sewage.

All sewers should be designed as open channels except for special conditions where a sewer must flow full all or part of the time. In a pressure sewer, sometimes called an inverted siphon, which flows full all the time, the velocity is directly proportional to the discharge; and, if adequate scouring velocities are to be maintained at minimum flows, extremely high velocities and high hydraulic slopes will be required for peak flows. This is not the case with

**THOMAS R. CAMP,**  
Consulting Engineer, Boston, Mass.

open channel or grade line sewers since the cross-sectional area of the stream decreases as the flow decreases. Nevertheless the velocity in grade line sewers does decrease as the flow decreases and consideration must be given both to peak flows which determine the size of the sewer and to minimum flows which determine whether the sewer will be self-cleansing.

## Design For Flow Volume

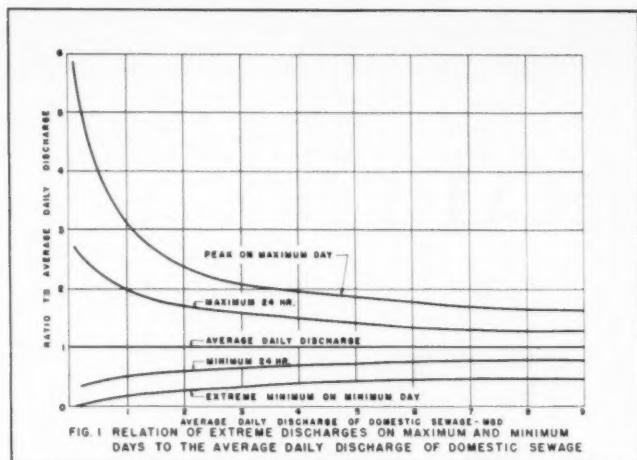
Sewers, sewage treatment works and water treatment works are usually designed to give satisfactory service throughout a design period of a selected number of years in the future. The significant rates of discharge at both ends of the design period must be estimated as shown in Table 1. The average daily flow, C and C' in the table, is the average 24-hour discharge during a period of one year, knowledge of which is essential for estimates of cost of operation of treatment works and pumping stations and for the deter-

mination of economic pipe sizes for force mains. In the design of sewers, A or B and E' are the significant rates of discharge. The ratio of E' to A is frequently so great that it is not possible to design a sewer with sufficient capacity to care for the flow represented by E' and at the same time have scouring velocities at the flows represented by A. In this case it may be essential to permit some deposits in the sewer at low flows provided the discharge may be expected to increase sufficiently during the 24 hours to pick up the deposits which were left during the period of minimum flow.

The design flows for sanitary sewers indicated by Table 1 are for sanitary or domestic sewage, liquid industrial wastes and ground water infiltration. Figure 1 shows the ratios of flows of sanitary sewage only which may be expected during any one year. This graph is based on studies of water consumption and sewer gagings of a number of Massachusetts municipalities (Massachusetts Senate Document No. 550 of 1947, Fig. 15). It may be used for design in the absence of data more specific to the problem at hand. The

TABLE 1—SIGNIFICANT RATES OF DISCHARGE

	Extreme Minimum	Minimum Daily	Average Daily	Maximum Daily	Peak
Beginning of Design Period	A	B	C	D	E
End of Design Period	A'	B'	C'	D'	E'



average daily discharge is proportional to the tributary population and may be estimated from the water consumption and sewer gagings if available. To the rates of discharge obtained by means of Fig. 1 must be added rates of infiltration of ground water to obtain design flows A to E' in Table 1.

Ground water infiltration is most appropriately estimated in terms of the length of sewers and services, and averages less than 10,000 gallons per day per mile of sewer for tight systems up to 40,000 to 50,000 gallons per day per mile of sewer for leaky systems. Ground water infiltration varies markedly from dry to wet seasons of the year. A study of a year's gaging of the Boston South Metropolitan high level sewer (Massachusetts House Document No. 2151 of 1949, Fig. 6) indicates an average ground water infiltration at the rate of 12,000 gallons per day per mile of sewer, a minimum rate of 3,000 gallons per day per mile of sewer and a maximum rate of 30,000 gallons per day per mile of sewer.

#### Determination of Size of Sewers

For the design of storm drains or combined sewers the size of the sewer is determined by the rainfall intensity it is desired to intercept. Intensities of 2 to 2.5 inches per hour which have frequencies of recurrence in New England of 5 to 15 years, are generally used for design purposes. The corresponding rates of run-off will range from 50 to 200 times the average dry weather flow of sanitary sewage. It is obvious therefore that self-cleansing veloci-

ties at dry weather flows are almost impossible to maintain in combined sewers. It is essential to depend upon storm water run-off to cleanse such sewers.

For economy, sewers are commonly laid at a slope approximating the slope of the ground surface and at the least depth consistent with the purpose and safety of the sewer. Sanitary sewers must be deep enough to intercept the house sewers from the lowest buildings and the lowest branch sewers. Where no house sewers or branches are required to be intercepted, the slope of the sewer may follow the ground slope except as dictated by the requirements of cover or by fixed elevations required at one or both ends of the sewer. The slope of the sewer is thus usually determined by the topography and the size is computed after the slope is tentatively fixed. In design, slopes should be selected which are in general slightly flatter than the slope of the ground in order to provide for invert drops at transitions and sewer size increases, both of which require head losses.

Storm drains are usually designed to carry the tributary storm water run-off for a particular frequency of recurrence. Since the minimum flow for a storm drain is usually zero, except for ground water, the size and slope of the drain should be such as to secure scouring velocities with moderate rainstorms. Deposits in storm drains do not ordinarily result in nuisance but they should not be permitted to accumulate so as to impair the capacity of the drains. Since the sediment to be carried by storm drains is mostly of a granular mineral nature, the parti-

cles of which have a greater density than sewage particles, greater velocities are required for scour than with sanitary sewers. It is general practice to design storm drains so that the full velocity will be not less than 2.5 to 3 feet per second.

For a given slope and peak flow the size of sewer required is usually determined in American practice by means of the so-called Kutter equation, which has come into general use despite its unwieldiness largely because graphs have been prepared for its use and are available in most texts on sewer design. Sewer designers have become familiar with values of the Kutter roughness coefficient  $n$  applicable to sewers.

The Manning equation, because of its simplicity and because it employs a roughness factor  $n$  whose value is substantially equal to the Kutter  $n$ , is coming into more general use. The Manning equation is:

$$V = \left( \frac{1.486}{n} \right) R^{2/3} S^{1/2} \quad (1)$$

where  $V$  = the mean velocity in fps,  $R$  = the hydraulic radius in feet,  $S$  = the slope of the energy grade line in feet per foot length of pipe and  $n$  = the coefficient of roughness.

Both the Kutter and Manning equations are applicable to pipes and conduits of all shapes flowing either full or partially full. The graphs which are commonly available for their solution have been compiled for the full conduit only and so-called "hydraulic element" graphs are used to determine the depth and mean velocity at other than full flows.

Figure 2 is an alignment chart prepared by the author for the solution of the Manning equation for circular pipes flowing full ("Minimum Velocities for Sewers", Comm. Rep., B.S.C.E., Oct., 1942, p. 293). It may be used with any value of  $n$  from 0.002 to 0.10. This chart also gives a solution of the equation  $Q = AV$  for the full pipe. The use of the chart is obvious from the example shown by the broken lines. It is also possible to use this chart for other shapes of cross section including conduits partially full if the discharge scale be ignored and the diameter scale be used such that the diameter taken is four times the value of the hydraulic radius of the actual cross section. The discharge (or velocity) must be computed independently from the relation  $Q = AV$ .

It is general practice in the United



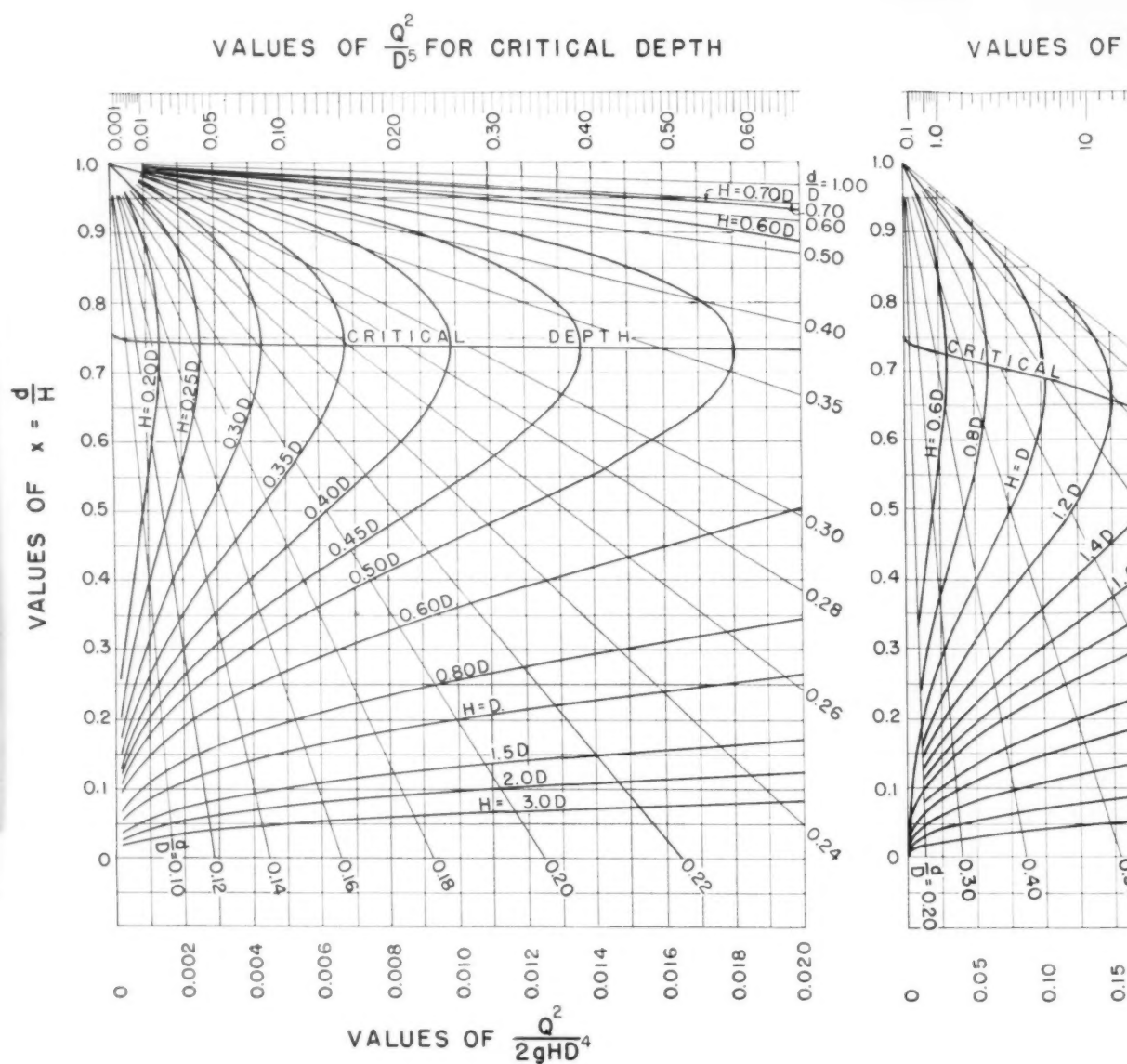


FIG. 8 DIAGRAM FOR ALTERNATE STAGES  
IN CIRCULAR PIPE



VALUES OF  $\frac{Q^2}{D^5}$  FOR CRITICAL DEPTH



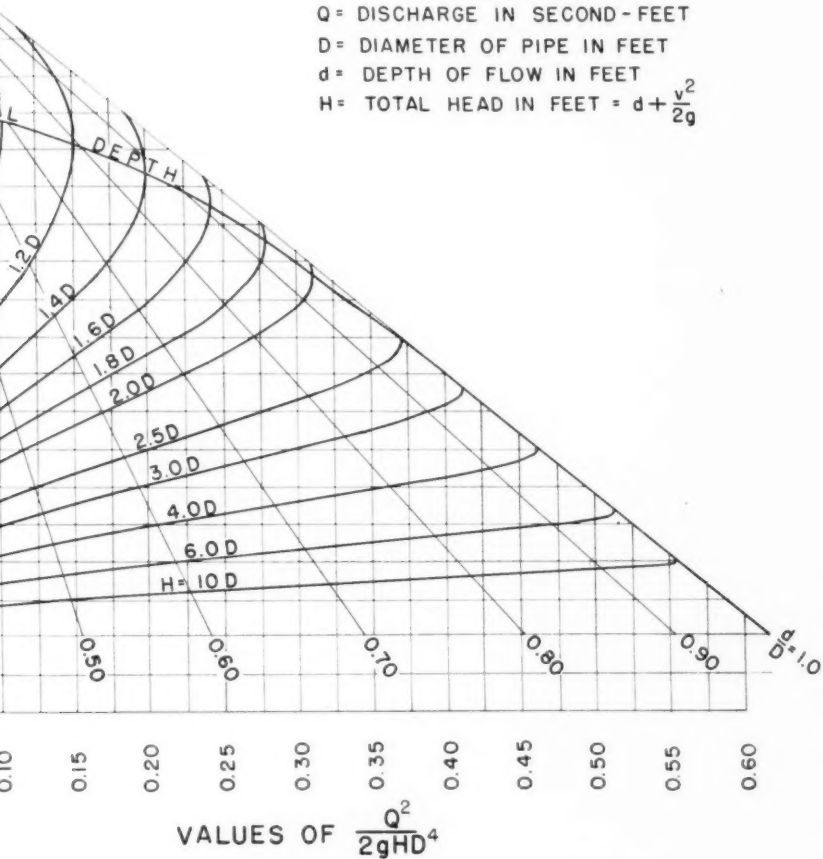
### LEGEND

Q = DISCHARGE IN SECOND-FOOT

D = DIAMETER OF PIPE IN FEET

d = DEPTH OF FLOW IN FEET

H = TOTAL HEAD IN FEET =  $d + \frac{v^2}{2g}$



STAGES AND CRITICAL DEPTH  
PIPES

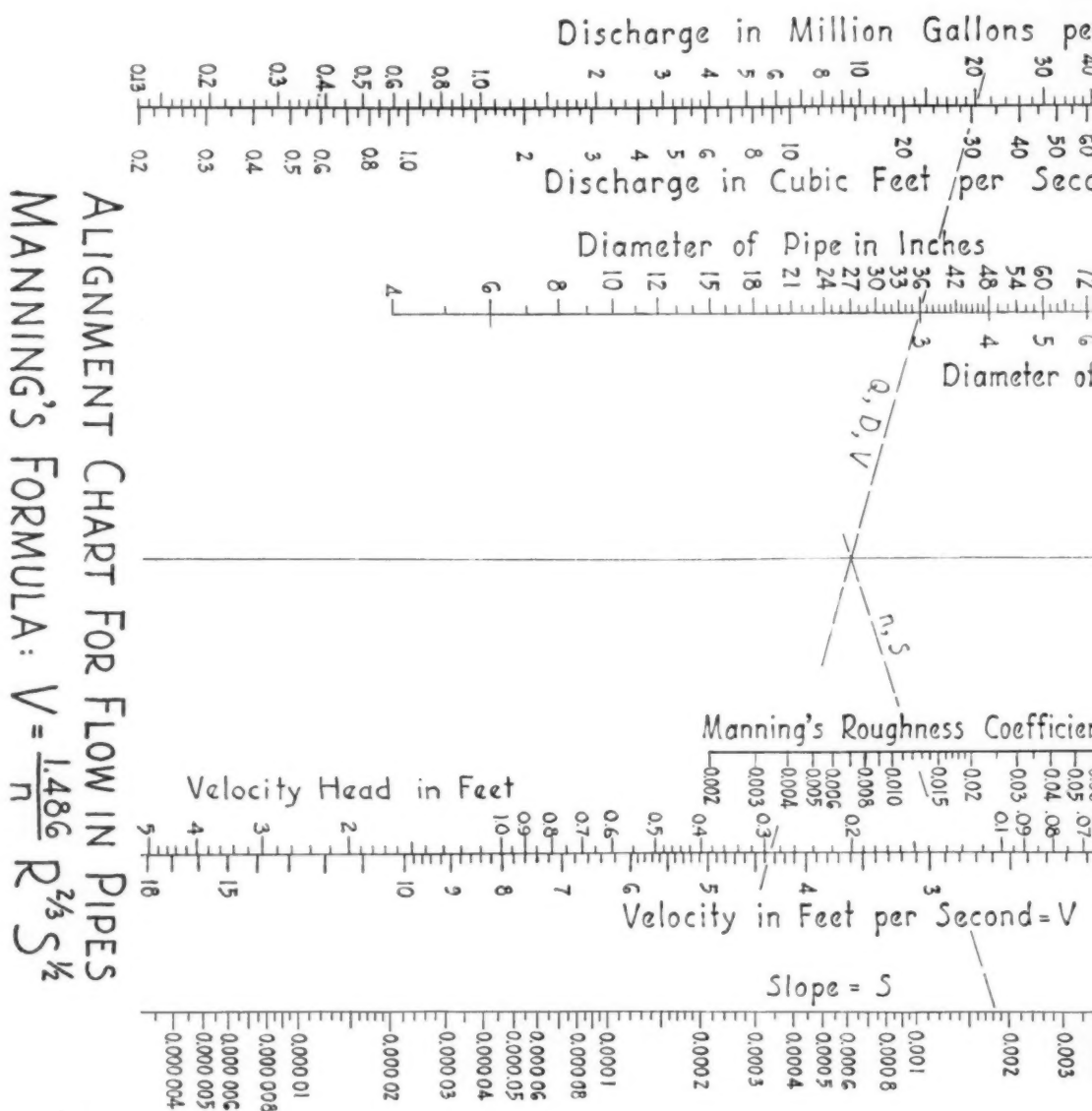
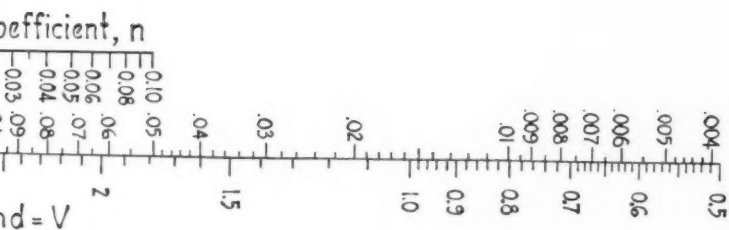
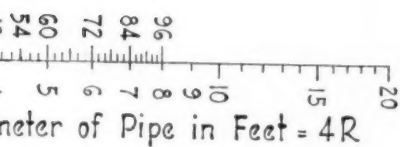
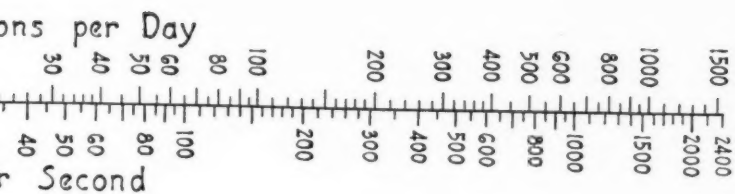


Fig. 2





States to use values of Manning's  $n$  from 0.013 to 0.015 for the design of small sewers and to assume these values hold, regardless of the depth of flow in the sewer. This practice has arisen largely as the result of gagings on partially full sewers. The experiments by Wilcox on 8-inch sewer pipe and by Yarnell and Woodward on drain tile 4-inch to 12-inches in diameter show that the friction factors for full pipe are less than are commonly used in American design practice and that the value of  $n$  increases for partially full sewers. (See BSCE report.) The experiments of Wilcox and of Yarnell and Woodward indicated that the value of Manning's  $n$  for clean sewer pipe and drain tile flowing full, both clay and concrete, ranged from 0.0095 to 0.011 with sizes from 4 to 12-inch inclusive.

Modern studies on the flow of fluids in full pipes indicate that the value of the resistance coefficient  $f$  in the Weisbach-Darcy formula:

$$\left(h_f = \frac{fL V^2}{D 2g}\right)$$

is a function of the Reynolds number and of the ratio of the radius of the pipe to the effective absolute roughness  $k$ . Professor Hunter Rouse has shown these relations for full circular pipes by means of a graph (Proceedings of the Second Hydraulic Conference, University of Iowa, 1942, p. 112). The relation between the value of the Manning friction factor  $n$  and the Weisbach-Darcy friction factor  $f$  is given by the following equation:

$$n = 1.486 R^{1/4} \left(\frac{f}{8g}\right) \quad (2)$$

where  $g$  is the acceleration of gravity. The values of the effective absolute roughness  $k$  have been computed from the tests of Wilcox and of Yarnell and Woodward and have been found to range from 0.002 inches to 0.016 inches. These values are relatively low and indicate that the joints in sewer pipe have little effect on the roughness. Computations of the effective absolute roughness  $k$  for other sewers indicate that for well built sewers with smooth surfaces  $k$  should be less than 0.02 to 0.025 inches. Figure 3 (Mass. Senate Doc. No. 550 of 1947, Fig 32) shows the effect of the diameter of pipe and the effective absolute roughness on the value of Manning's  $n$  for full pipes. It is obvious from this figure that for a given character of wall surface the value of  $n$  is greater for large pipes than for small pipes. For example, with an effective ab-

solute roughness of 0.020 inches the values of Manning's  $n$  for full pipes will be 0.0114 for 24-inch pipe and 0.0126 for a pipe 10-feet in diameter. This finding is comparatively recent and is contrary to former practice in which it was assumed that lower values of Manning's  $n$  could be used for larger size pipes than for small pipes.

The hydraulic element graphs in common use have been prepared on the assumption that the friction coefficient  $n$  does not change with the depth of flow in the conduit. It has been known for many years that this assumption is erroneous but it has been necessary to continue the use of the charts because of the lack of adequate data with which to correct them. The experiments of Wilcox and of Yarnell and Woodward show that the value of  $n$  for pipe flowing partially full is greater than for the full pipe and on the average has values such as are indicated by the curve through the points marked by circles in Fig. 4. The figure also shows a similar curve for the Weisbach-Darcy friction factor  $f$ . The relation between the two friction factors is

$$\frac{n}{n_{full}} = \left(\frac{R}{R_{full}}\right)^{1/4} \sqrt{\frac{f}{f_{full}}} \quad (3)$$

The points on the figure marked by triangles and x's were estimated from measurements made by Johnson in large Louisville sewers flowing partially full. The values of  $n$  and  $f$  in Fig. 4 above 0.4 diameter are more reliable than those below but none of the values of  $f$  and  $n$  for partially full pipes is very re-

liable and precise measurements are badly needed.

In Fig. 4 the curves for discharge and velocity as obtained from the usual assumption of a constant value of  $n$  are shown by broken lines. In accordance with this assumption the velocity is the same for a half-full pipe as for a full pipe whereas if Manning's  $n$  is taken to vary with the depth as shown, the velocity at half depth is only 0.8 the full depth velocity.

In determining the size of sewers it is usual practice to design small sewers to flow about half-full at peak discharge at the end of the design period with a minimum size of pipe for sanitary sewers of 8 inches. Large sewers are usually designed to flow 7/10 to 8/10 full at the peak rate of discharge at the end of the design period. In fixing the slope and size of sewers, consideration must be given in flat terrain to self-cleansing velocities at minimum flows and in rugged terrain to alternate stages and critical depths. The flow should not be too close to critical flow at the peak rate of discharge because of instability of flow at this depth. Slight changes in the friction factor might throw the flow from lower to upper alternate stage and result in sewer surcharge or overflow at manholes.

### Self-cleansing Velocities

A theoretical development by Shields based upon experiments by himself and others on bed-load movement of uni-granular materials indicates that the critical tractive force required to produce motion of

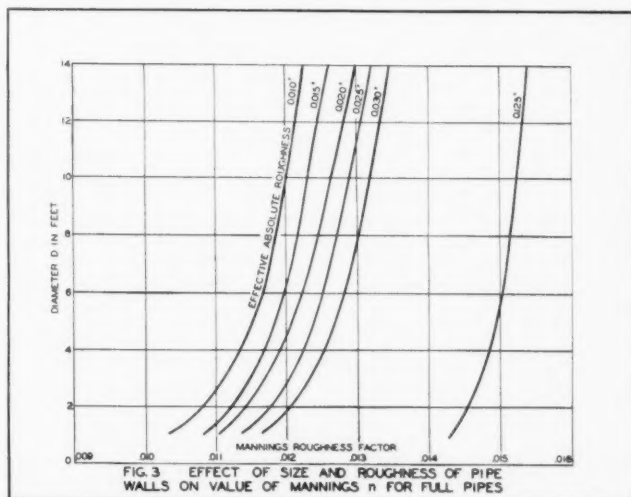


FIG. 3. EFFECT OF SIZE AND ROUGHNESS OF PIPE WALLS ON VALUE OF MANNING'S  $n$  FOR FULL PIPES



the particles along the bottom is approximately proportional to the diameter of the particles and their submerged weight per unit of volume. (See final report of Committee to study limiting velocities of flow in sewers, Boston Society of Civil Engineers, March 4, 1942, p. 350.) From the findings of Shields the author has derived the following equation for the velocity required to transport sediment:

$$V = \sqrt{\frac{89}{f}} g (s-1) d \quad (4)$$

where  $V$  is the mean velocity in the conduit,  $d$  is the diameter of the particle to be transported,  $s$  is its specific gravity,  $g$  is the gravity constant,  $f$  is the Weisbach-Darcy friction factor of the conduit and  $\beta$  is the proportionality constant from the work of Shields the value of which is about 0.04 to start scour and ranges up to 0.8 or more for adequate cleansing.

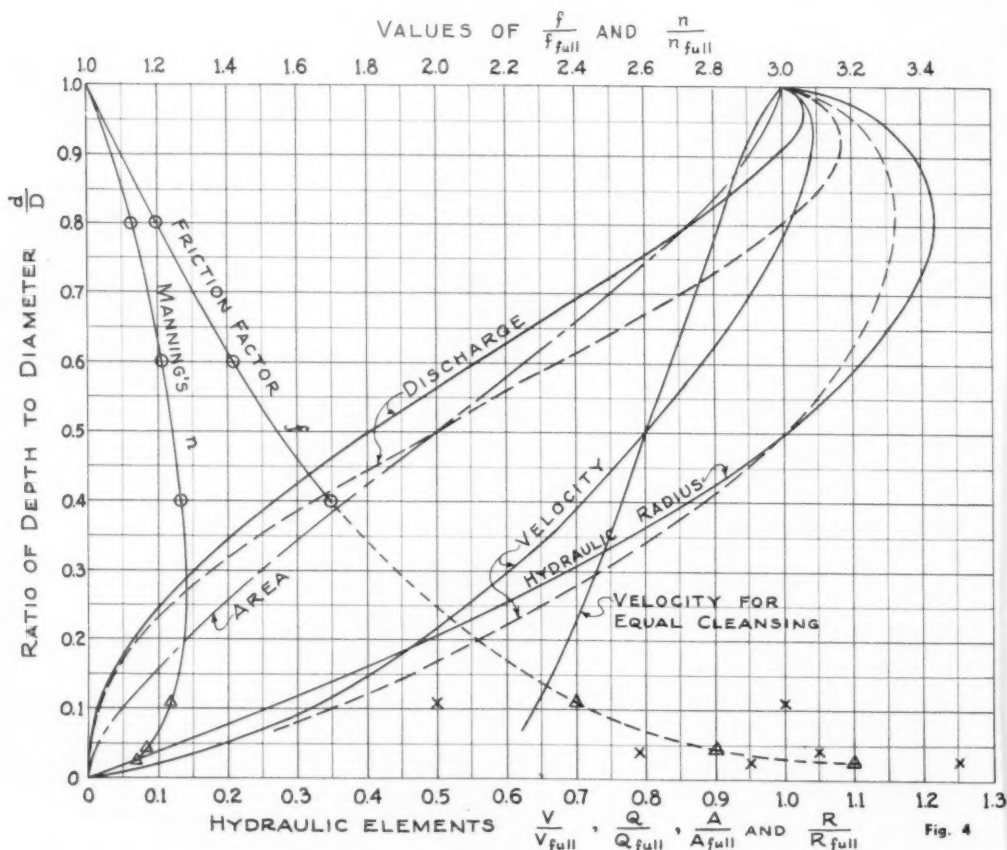
It will be noted from the equation that the ability of a stream to transport sediment of a given character depends upon the mean velocity and friction factor and is independent of the depth. Since the friction factor  $f$  is greater the less the depth of flow in a pipe, it follows from the equation that less velocity is required for self-cleansing a partially full pipe than for a full pipe. The relation between the velocity in a partially full pipe and that for a full pipe for the same cleansing effect is marked on Fig. 4 by the curve marked "Velocity for equal cleansing". For smaller depths of flow there is more disturbance in the liquid evidenced by the higher friction factor and this increased disturbance assures equal cleansing with lower mean velocity.

It has been common practice to design sanitary sewers with a full velocity of not less than 2 fps to insure self-cleansing. Experience in-

dicates that some sewers designed for the velocity when full of 2 fps are not self-cleansing while others with lesser full velocities are self-cleansing. The probable reason for this anomaly is that the sewers which are not self-cleansing flow only at shallow depths most of the time. Experience further indicates, nevertheless, that a 2 fps velocity is adequate for self-cleansing with an average municipal sewer if the sewer flows more than half-full.

The Boston Society of Civil Engineers committee recommends that in general for adequate cleansing, sanitary sewers be designed with slopes at least great enough to develop a cleansing velocity at the minimum daily flow (B of Table 1). In the case of laterals with few house connections, the discharge rates in Table 2 are recommended as it may be expected that they will be exceeded at least once a day.

Figure 5 was compiled by the au-



thor to facilitate the determination of minimum slopes required for self-cleansing. It is based upon a Manning's  $n$  of 0.012 for the full pipe, the data of Fig. 4 and the assumption that a velocity of 2.0 fps is required for self-cleansing with the pipe flowing full. The figure applies to pipes ranging from 6 to 24 inches in diameter, each pipe size being indicated by a separate curve. The curves are for pipes flowing half-full and less, the ratio of depth to diameter being shown by small circles at 0.05 intervals in value. For a fuller discussion of the principle underlying the preparation of this figure, see the Boston Society of Civil Engineers committee report. It will be noted from the figure that a slope of 4 ft. per thousand is adequate for self-cleansing of an 8-inch pipe provided the minimum daily discharge is not less than 0.13 cfs or provided the depth is not less than 0.31 of the diameter.

#### Sewer Transitions

In sewer design it is usually assumed for simplicity that the flow is steady and uniform throughout a stretch of sewer between increments of flow, provided of course there is

no change in the size or grade within the stretch. To simplify the design of sanitary sewers it is usually assumed that all increments of flow from house sewers within a stretch enter at the upper end of the stretch. For small sewers it is desirable to provide manholes at each end of a stretch and at intervals of 200 to 600 ft. to facilitate inspection and cleansing and to make the stretch straight in line and grade between manholes. For small sewers, transitions, curves and junctions may be confined within the manholes. For larger sewers special structures are required except for curves where the sewer itself may be designed to conform to a definite curve.

If the transitions between stretches are properly designed the assumption of uniform steady flow within the stretch for the short period during which peak flow takes place is a close approximation and fully warranted. If the transitions are not properly studied, however, and sufficient allowance is not made for invert drops at transitions, the transitions may reduce the expected capacity of the sewer and cause surcharge at the peak design flow. It should be pointed out that the practice of designing transitions so that the crowns (or the inverts) of abut-

ting sewers are placed at the same elevation without regard to the energy conditions is faulty.

It is convenient in transition design to assume first that the energy loss, invert drop and change in water surface due to the transition are concentrated at the center of the transition and then to distribute these changes smoothly throughout the length of the transition when it is detailed. The method is illustrated in Fig. 6 where  $h_T$  represents the head loss due to the transition and  $y$  represents the required drop in the invert due to the transition. This procedure permits the sewer design to progress before the transition design is undertaken. It is necessary only that adequate allowances be made during sewer design for the invert drops  $y$ .

It is to be noted particularly that the transition head loss must be applied to the energy grade line and not to the hydraulic grade line (i.e. the water surface). The errors involved are insignificant in sewers where the velocity is less than 2.5 fps because the velocity head itself is small (0.1 ft.), but for higher velocities grave errors may result from improper design of transitions. Even with low velocity sewers, consideration must always be given to invert drops where increments of

TABLE 2.—SEWAGE DISCHARGE RATES

Number of houses	1	2	3	4	5	10	20
Discharge, gpm	7	12	17	21	25	38	57
Discharge cfs	0.016	0.027	0.038	0.047	0.056	0.085	0.127
Min. slope, 8-in. pipe ft./1000	14	11	8.5	7.4	6.7	4.8	3.8

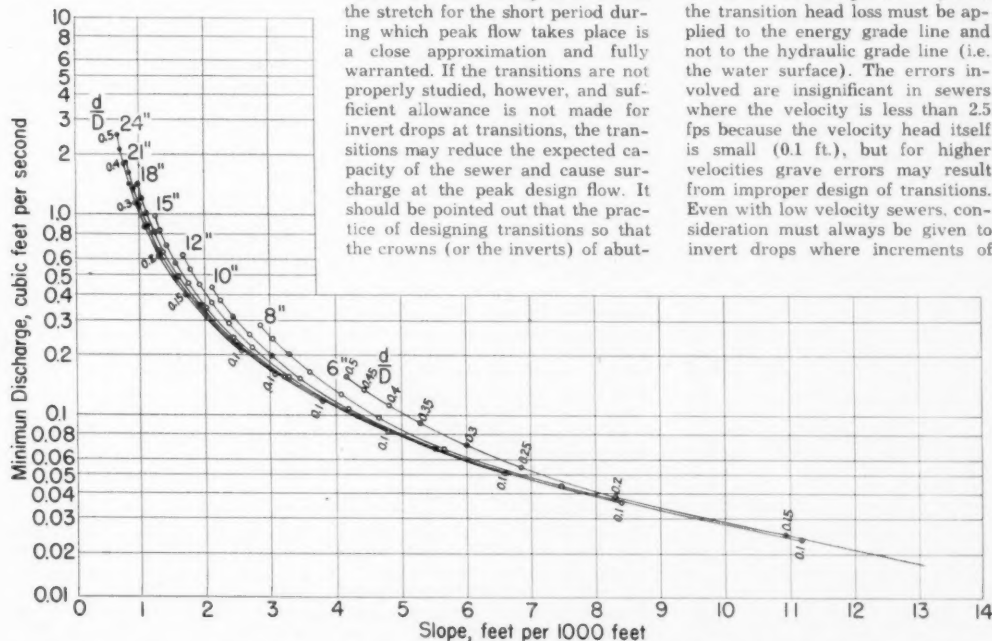


Fig. 5. Slopes required for cleansing at minimum discharge equal to cleansing in full pipe at 2.0 feet per second velocity. Manning's  $n=0.012$  for full pipe.

flow are accepted in order to avoid backwater curves with attendant low velocities in the upstream stretches of sewer. Except for some special and infrequent cases involving junctions, the energy grade line falls through a transition. The hydraulic grade line however may rise and usually does in transitions involving substantial decrease in velocity.

For convenience the sewer inverts may be taken as datum and the total energy heads  $H_u$  and  $H_l$  in the upper and lower stretches of sewer where uniform flow is assumed to take place, may be measured upward from the inverts. In each case the energy head is the depth plus the velocity head, or:

$$H = d + \frac{V^2}{2g} \quad (5)$$

and the energy grade line is parallel with the invert and water surface at a height equal to the velocity head above the water surface.

From Fig. 6 it is obvious that the required invert drop  $y$  is readily obtainable from the relation:

$$y = H_u + H_r - H_l \quad (6)$$

In the design of a transition,  $y$  may have a value from zero to several feet in magnitude. If a negative value of  $y$  is obtained from the equation, it should not be used in design because it will result in placing the invert of the lower pipe at a higher elevation than that of the upstream pipe, creating a sump for the collection of grit and other suspended matter. If  $y$  is negative from the equation,  $y$  should be taken at zero whereupon the head loss  $h_r$  becomes greater than the minimum computed and there will be a drawdown curve in the upper stretch of sewer. This is the case which frequently occurs when a small steep sewer discharges into a larger sewer with a flat slope.

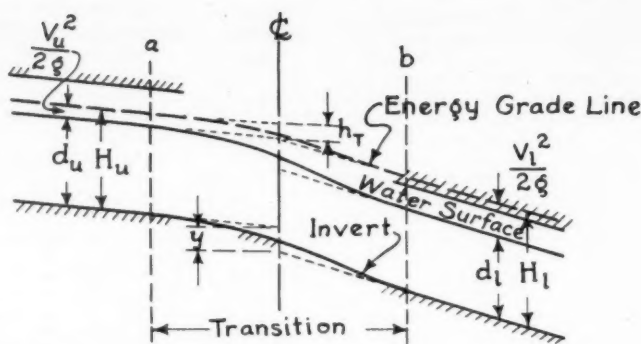
Data on the magnitude of the transition loss  $h_r$  for sewers are almost completely lacking. No reliable measurements of such losses in sewers have ever come to the author's attention. There have been experimental studies in recent years on both contracting and expanding transitions but usually the cross section has been rectangular. The most reliable data available for use are measurements of head losses in flume and siphon transitions for irrigation purposes made by the U. S. Bureau of Reclamation. These data are analyzed in a paper by Julian Hinds (Trans.A.S.C.E., 1928, p. 1423) who recommends that the head loss for a well designed transition may be estimated by the equation

$$h_r = k \Delta \left( \frac{V^2}{2g} \right) \quad (7)$$

where  $\Delta \left( \frac{V^2}{2g} \right)$  is the change in velocity head through the transition and  $k$  is a factor which may have a value as low as 0.1 for increasing velocity transitions and 0.2 for decreasing velocity transitions. Since the velocity heads are quite small in most sanitary sewers, it is the opinion of the author that larger allowances should be made for transition losses with a minimum value of 0.02 ft. in any case.

The transition data studied by Hinds involved flow in the upper alternate stage (sub-critical flow) in all cases and the values of  $k$  which he recommends are strictly applicable only to sub-critical flow. There are many sewers in which flow must take place in the lower alternate stage (super-critical flow) and hence sewer transitions may involve flow from upper to lower, from lower to upper or from lower to lower stage. Where a lower stage is involved the value of  $k$  will probably be greater than stated above and if flow is from lower to upper stage a "hydraulic jump" will take place with considerable energy loss.

Because of the above considerations it is advisable as part of design procedure to determine at what stage flow will take place in all sewers. It is also advisable that sewers be designed to avoid flow at or too near the critical depth. Critical flow is unstable and slight changes in friction within a stretch may result in substantial changes in depth and velocity. If, in the preceding energy equation,  $V$  is replaced by its value  $Q/A$  and  $A$  is expressed as a function of the depth  $d$ , the equation becomes a cubical



● FIG. 6 illustrates factors in transition design, including energy grade line, water surface and required drop in invert.

equation in terms of the depth  $d$ . One of the three roots of this equation is negative and unreal but the other two values of  $d$  represent the two alternate stages at which flow may take place with a given energy head  $H$ . If the flow is uniform the slope of the sewer determines which of the two stages will obtain. The solution of the cubical equation for a rectangular cross section is shown graphically in Fig. 7 and for circular conduits flowing partially full in Fig. 8. These graphs were prepared by the author to facilitate the design of sewer transitions as well as to study backwater and drawdown curves in sewers.

Figures 7 and 8 may be used to investigate the stage at which flow will take place.

### Sewer Junctions

Most sewer transitions are also junctions where a branch sewer enters a main sewer. In this case there are two flow paths, the lower stretch of main sewer being common to both. In at least one of the streams there is curvature and the value of  $h_r$  for this path should include the effect of curvature. An additional allowance in head loss should also be provided for both paths to care for the impact loss due to the converging streams. The hydraulic design of a junction is, in effect, the design of two transitions, one for each flow path.

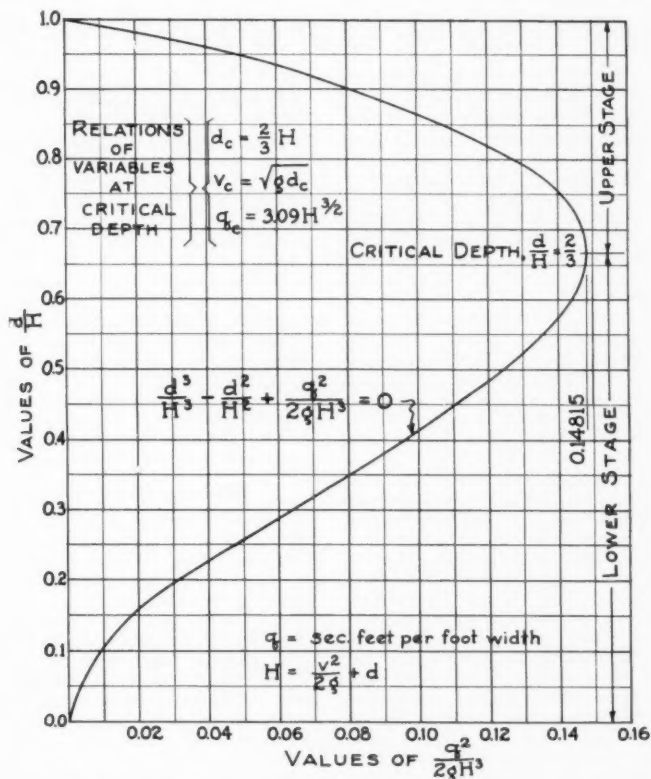
The impact loss at a junction is, theoretically, subject to computation by the momentum principle. This principle has been successfully applied to the computation of head loss in a hydraulic jump occurring in rectangular open channels. For a junction of two or more streams meeting at an angle, the pressure plus the linear momentum below

the junction point must equal the sum of the components of the pressure and momentum of each tributary stream in the direction of flow of the stream below the junction. The energy loss due to impact in the junction is the difference between the total energy in the stream below and the sum of the energies of the tributary streams. There will always be an energy loss of appreciable magnitude due to impact at the junction. It is conceivable, however, that in some cases, such as with a large stream at high velocity into which a small low velocity stream is discharged, there may be a gain in energy along one path at the expense of a greater loss along the other path. In sewer design it is not safe to assume that an impact loss may be negative, for if the assumption be in error the upper stretch of sewer will be subjected to backwater and possible surcharge.

Unfortunately, it is not practicable to apply the momentum theory to the actual design of junctions. In

making the application, it is necessary to choose cross-sections just above and below the junction for which pressure and momentum computations are made. To the pressures thus computed must be added the pressure components in the direction of flow along the walls and floors of the channels. The pressure components on the walls and floor are a considerable part of the total pressure, but they cannot be accurately determined because their magnitudes are influenced by the impact of the streams and the curvature.

Figures 2 and 8, referred to in the text, are inserted between pages 60 and 61. These may be used as they are or may be reproduced for mounting for office use, using a larger scale.



● FIG. 7. Solution on the cubical equation for a rectangular conduit flowing part full. Fig. 8 is for circular conduits.

## Wartime Water Supply in London

A report recently published by the London Metropolitan Water Board describes the steps taken to maintain an adequate and wholesome supply of water during the war years. (Thirty-fourth Report on the Results of the Bacteriological, Chemical, and Biological Examination of the London Waters for the Years 1939-1946.) The author is Lieutenant-Colonel E. F. W. MacKenzie, the Board's director of water examination. Two schools of thought existed when defense plans were being prepared before war broke out: one considered that it was unnecessary to take precautions against disasters which might not occur; the other maintained that every practicable precaution should be taken to provide against any contingency. Fortunately for the people of London the second view prevailed, and how amply it was justified is set out clearly in the pages of the report.

The emergency plans of the Board were concerned first with the repair of mains damaged or broken by bombing (it took some time to discover that concussion from bombs exploding some distance away could fracture water mains without affecting the ground above them); secondly, with ensuring that laboratory tests could quickly be carried out in order to estimate the purity or otherwise of the supply after damaged mains had been repaired; and, thirdly, with the purification by the quickest possible method of repaired water channels after they had been contaminated by sewage. The value of prechlorination—chlorination before filtration—in such times of emergency was proved beyond any doubt, as will be appreciated by all who read the report. So successful was this procedure that in some places the old river intakes (for instance, at Hampton) were opened, and unstored river water was led to the filters. Steps were taken to protect wells also, though fortunately none of the Board's wells was very seriously affected by bomb damage.

The policy of the Board was that no repaired main should be brought back into service without prior disinfection. The methods of disinfection were remarkably successful. Samples were examined from 807 of the 875 large mains which were fractured by bombs, and of these

(Continued on page 126)





● MIAMI'S South West water treatment plant, as it will look when it is completed.

## HOW MIAMI GETS WATER FOR A DOUBLED POPULATION

C. E. WRIGHT

"WATER for the Magic City" is the title of a booklet describing the water supply expansion program for Miami, Fla. Last December the Department of Water and Sewers took bids on a general contract for constructing the Southwest Water Treatment Plant, which is a part of a \$9,000,000 extension of the water supply system. This is another step in the almost endless program of water procurement.

Miami's water problem is different from that of most cities in several respects: (1) It is believed to be the largest city in the country dependent wholly on well water for its public supply; (2) it has in the past suffered from salt water intrusion during dry periods when the water table was low; and (3) population growth has been very rapid.

As an indication of how fast the Miami Water and Sewers Department must run to keep up with itself, here are a few figures: In the decade from 1940 to 1950 Dade County's all-year residents expanded from 267,488 to 488,689, a gain of more than 82 per cent. Miami grew from 172,172 to 246,983, an increase of more than 43 per cent. Miami Beach jumped from

28,012 to 45,541, or nearly 63 per cent. As the Miami water department supplies a good part of Dade County with water, the county figures are the most significant.

But these figures tell only half the story. Dade County has 213,984 rooms in hotels, motor courts, apartments and rooming houses, according to official count by the State Hotel and Restaurant Commission. Most of these are filled during the winter season, while the summer season is now beginning to catch up in number of visitors. Thus the Miami water supply has to be stretched during some months to provide for an almost doubled population.

Adding to the large influx of winter visitors is the fact that the period from mid-November to April is the season of little or no rainfall. The lawn sprinkling load is heaviest at that time. Illustrating the variation in the supply situation is the fact that during the summer and rainy season, when air conditioning is an important factor, the average daily consumption is 48,000,000 gallons, whereas during the peak of the winter and dry season, February and March, the daily pumping rises to 70,000,000 gallons or more. The growth of the Greater Miami area is indicated by the fact that 23,000,000 gallons a day was

the average requirement ten years ago.

As the city has no surface water in the volume and of the potability required for its needs, it depends entirely on wells. Some of the earlier ones were sunk too near the ocean, resulting in salt water contamination during dry periods. The new supplementary field will be to the southwest of the city, nine miles from its center, as a precaution against further difficulty of that kind. A prior installation, which is still in service, is at Hialeah, also distant, though not quite so far, from the danger of salt water intrusion. However, proper control of the canals must be maintained.

### The New Well Field

The Southwest well field will have eight 18-in. wells sunk to a depth of 100 ft. These will supply a total of 40 mgd., though tests have shown that each well might produce as much as 10 mgd. A treatment plant will also be built. Miami's present water supply is obtained largely from the Hialeah field, which has 22 wells, which at maximum capacity can produce from 71,000,000 to 72,000,000 gallons a day.

Expansion of Miami's water system is dictated not only by current needs, but as a protection for the



future. It is estimated that the growth in permanent residents plus the normal increases that have been occurring in the number of summer and winter visitors will have been doubled by 1960, and plans are being made toward that end.

Of the \$9,000,000, which the new expansion program will cost, nearly \$3,000,000 has already been spent for water-bearing land, rights-of-way, large delivery lines, and for the treatment units and emergency wells at the southwest plant site. About thirteen miles of large pipe lines have been laid. Reinforced concrete pressure pipe was manufactured at the site of the treatment plant. All pipe was designed for a working pressure of 120 psi. Each length consists of a welded steel shell with jointed sleeves welded on the ends, tested at 200 psi, a 3-in. thick poured and vibrated concrete inner liner, a wrapping of pre-stressed high tensile strength wire on the outside of the steel shell, and a final  $\frac{3}{4}$ -in. cover coat of sand and cement mortar. Joints were made with circular rubber gaskets completely sealed with neat cement mortar. Each 16-ft. length of 48-in. pipe weighed eight tons. The pipe cost \$1,126,042 to manufacture and \$495,990 to install.

With additional 20-in. cast iron pipe required for connecting lines and valves, meters and other equipment, the total cost of the connecting pipe lines was \$2,133,600.

Three test wells have been sunk in the new field. Studies of the water treatment problems were made by Dr. A. P. Black of the University of Florida, former president of the American Water Works Association, and numerous experiments were made in the city's Hialeah laboratories as to the effects of the various methods of treatment. The mineral analysis of the well water from test well No. 1 showed pH 7.3; color 6; dissolved solids 260-270; total hardness 217; MO alkalinity 190; chlorides 12; and iron 0.5.

### The Treatment Plant

The treatment plant will consist of four upward-flow softening units, a recarbonation basin, eight filters, a pure water reservoir of 5 mg capacity, and a high-lift pumping station to deliver the water to Miami at distribution pressure.

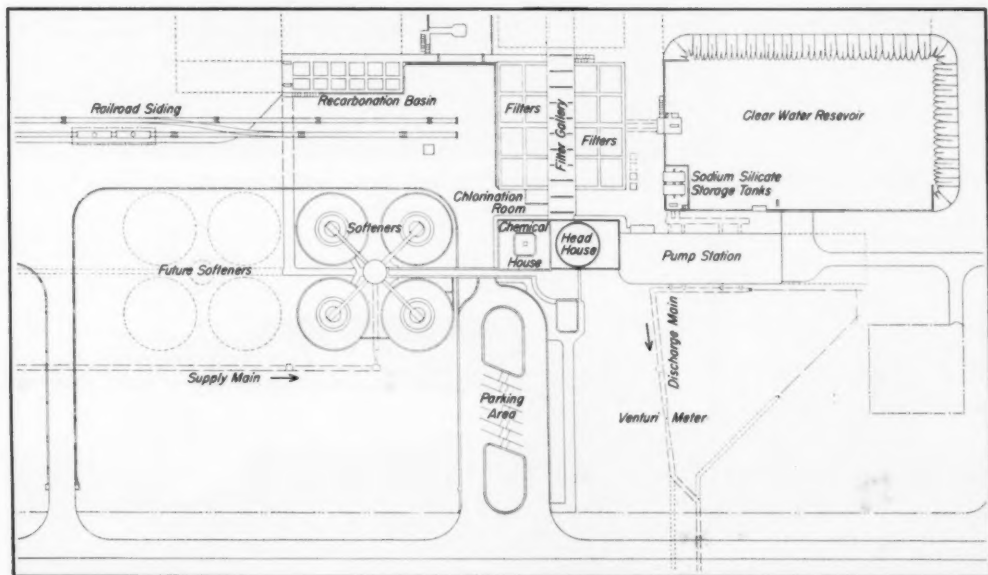
The upward-flow units, which have already been installed, are the Dorr Hydro-Treators. Each unit has a rated capacity of 10 mgd and is equipped to discharge automatically the sludge to the sludge field.

Provision is made for treating the water with lime, alum and sodium silicate, as well as with chlorine for disinfection and for color removal.

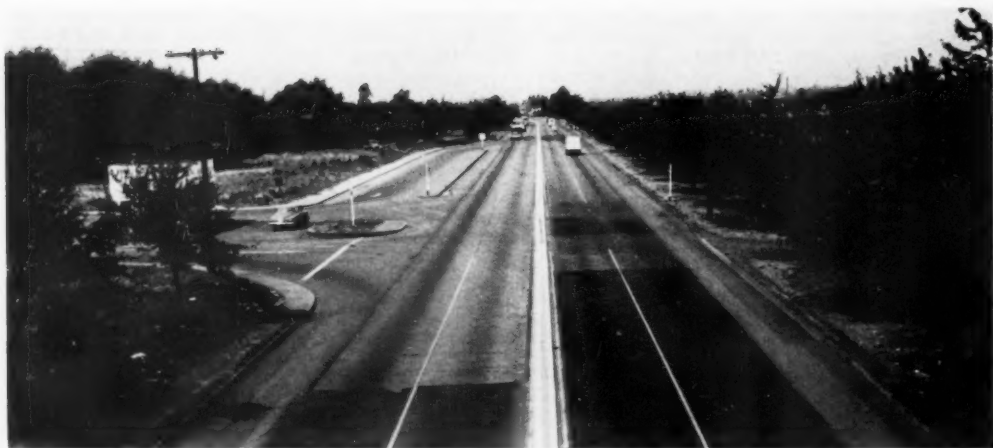
The effluent from the upward-flow units will flow to a recarbonation basin having 15 minutes retention. In the original design the water flows from this basin directly to the filters, but provision is being made for the possible construction of a basin to be used for break-point chlorination and aeration. The latter processes will be needed should the color in the water increase appreciably due to heavy drafts in the well field.

The filters consist of eight units of 5 mgd capacity each, designed to run at the rate of 3 gpm per sq. ft. They will have 24 in. of sand of effective size of 0.45 to 0.50 mm. Pipe grid underdrains are being used. Hydraulic valves are provided for controlling filter washing, which will normally be at the rate of 30 in. of vertical rise per min. The washwater tank will contain sufficient water for two washes. Wastewater will be caught in a second tank called the washwater receiver, and pumped back into the influent to the softener, as is now being done at Hialeah. The water

(Continued on page 124)



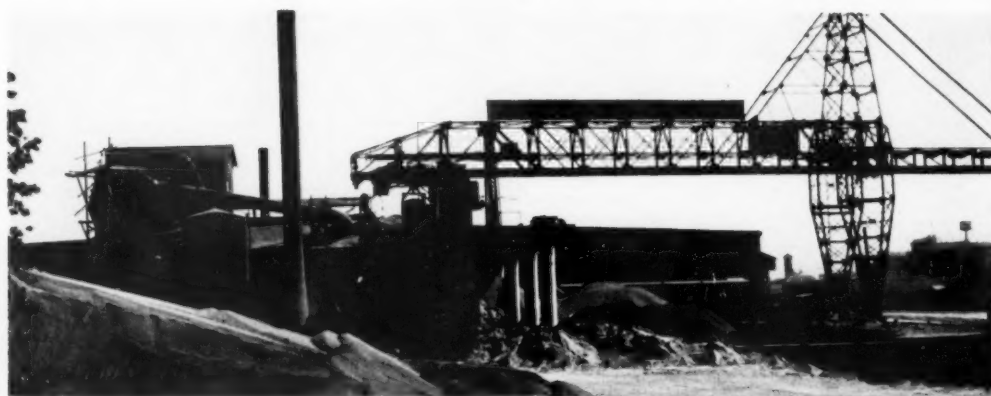
● PLAN of new treatment plant. Filter capacity is 40 mgd. Softening and recarbonation will be provided. A high-lift pumping station will deliver water to the city.



● **DESIGNED** for fast traffic, McLoughlin Blvd., SE, is one of Portland's most important streets.



● **STREET** resurfacing project employs Buffalo-Springfield roller and Barber-Greene paver.



● **MUNICIPAL** paving plant has delivered as much as 1,100 tons of surfacing in 10 hours.

# PLAN YOUR STREET MAINTENANCE ON “BUSINESS AS USUAL” BASIS

PORTLAND, Oregon, maintains its streets like a merchant continuing business while his establishment is being remodeled. It could well put up the customary sign on its jobs: “Come in—Business as Usual.”

The re-dressing of Sixth Avenue, S.W., is an example. This is one of the three most important north-and-south thoroughfares. It was never closed to traffic. While the re-dressing proceeded briskly on one side of a block, traffic used the other side. Then with half the width finished, the equipment and the traffic swapped sides, throwing the traffic in on the new work. Even the heavy buses of The Portland Traction Company, weighing about 12 tons loaded, rolled over surface finished not thirty minutes before.

To a practised engineering eye this traffic leaves its mark on the new work. It would be undesirable to follow this method on two-way streets, for the cars might be concentrated, making clearly discernible tracks. But all the down-town streets in Portland are one-way, so the traffic spreads out across the entire width. The impressions of wheels on the new work are light, and are quickly ironed out.

The reason for this policy is the belief that the public should get all the breaks. This has been accepted over many years, but it is followed more closely by Commissioner of Public Works Wm. A. Bowes than by his predecessors. Portland has its roots in conservative New England, and it is not impressed unduly by the rigorous go-getting self-punishment of so-called progressive cities. The people of Portland take time to live, especially when it rains, and the paving work can wait. It is not considered patriotic to tell how much it rains.

## Work By Force Account

All street maintenance is done by the city on force account. There is a curious division of responsibility. It stems from some time ago

## GUY BROWNING ARTHUR

when both new work and maintenance were done on contract. Prices rose steadily until the condition became unhealthy. So the city built its own paving plant, and entered the field as a bidder on its own work. That brought the contract bids down to reasonable figures. The plant is important for new work now only to stabilize bidding. It justifies its existence in that way, and does its day-by-day job of making mixes for maintenance needs.

To make the most of the plant for its original purpose, its operation was put directly under the Commissioner of Public Works. A. D. Vance, Assistant to the Commissioner, is in charge of the plant and of all hard-surface maintenance.

Wm. T. Bowen is superintendent of the Paving Plant Bureau. He ties us back to the good old days—as some engineers reminisce—of Belgian blocks and wood blocks. The burr on his tongue will get him into Scotland without a passport, but he's really from Wales. He came over in 1906, and began to apply his skill in laying Belgian blocks for contractors. He remembers with chagrin how he had to lay them in the latter days of that vogue with tight mortar joints. “And o' cour-rse, mon,” Billy Bowen exclaims, “they blew up. What might ye expect? They dinna ha' any room to expand!” His wood blocks went the same way, only they blew up higher and more often.

He has been with the city since 1914, and in charge of hard surface work most of that time. He is no desk superintendent. You find him out where the job is going full tilt, and his eye can pick out a low place in the pavement a block away.

Ray Walley, who runs the paving plant, has been working for the city about as long as Bowen. His plant had a rated capacity of 800 tons in 8 hours, but he has delivered

1100 tons in 10 hours. The stuff comes out as specified, on time, and no one wonders about it.

Much wisdom grows in 36 years of conscientious service. One can still spark an argument on one of those jobs about the comparative merits of No. 1 mix and No. 4 mix, on either the skid or non-skid side, but today it will always be one or the other. It is spread when almost cold. That has a lot to do with its power to support traffic. The method fits the requirements of placid Portland, and why bother to ask any more questions? Especially when no city has better looking streets, or cleaner ones.

## The Maintenance Job

For other than hard surface work the city organization gets back to normal. All of this is under the City Engineer, L. G. Apperson, with R. Ray Schieve in charge as General Foreman. Of course this work has the same claim on the output of the paving plant as the hard surfaces. While the busy downtown streets must receive their full share of material, the outside streets grow up in the usual manner from center strips of gravel through stage after stage until they are hard surfaced. In this growing-up process over the years they must have various oils and bituminous mixes.



The size of Portland's maintenance job is surprising, even for a city that claims half a million people, counting the suburbs. The grown-up sections have 693 miles of hard surface streets, and there are 450 miles of gravel and various types of macadam. From 20 to 25 miles of streets are added each year, chiefly on the assessment basis. In addition,

the city improves certain streets beyond the neighborhood requirements to make them arterial thoroughfares, and assumes the cost. Certain access roads and streets then come naturally into the same classification, as feeders.

In the deep depression days, Portland made work for unemployed by building center strips on many outlying streets. Abutting property paid for the material, often only gravel or crushed stone, and the city supplied equipment, oil, bitumen, and other needs. The plan made a lot of work, but it gave the city an unusually large mileage of center-strip streets. These, improved through the customary stages, have required programmed maintenance, which actually was steady improvement in types.

During the fiscal year 1950-51 the city laid 650,418 sq. yds. of paving for maintenance or repairs. This included all forms of hard surface repairing, from patching a hole one foot square to a full width asphaltic re-dress.

It covers not only the repairs for which the city takes responsibility, but also all paving over plumbers' cuts, all work done for The Portland Traction Company, such as covering abandoned street car tracks, and all work for the public utilities having franchises for under-surface installations.

### **The Sixth Avenue Job**

The Sixth Avenue job is a good example of straight paving. It has just been re-dressed through the business area with 12,000 sq. yds. of asphaltic concrete No. 1. The new surface averaged 1½ ins. to 2 ins. in thickness. The entire street, 50 feet wide between curbs, but much wider at one very broad intersection, was leveled and smoothed out. In one depression the new coat became 6 inches thick. The new surface was bonded at the curbs with 80-100 asphalt. That rates as a big job.

Little jobs are done by the score. In Portland any householder can complain about a bump in the paving, and in short order one of the small maintenance crews will be on the job. It may be that some other city treats these requests with equal respect, but Portland has a way of its own with the public. This maintenance crew comes along with a small truck containing an air compressor, pneumatic hammers, patching material, and other tools. The offending bump is cut out, though it may be only one square foot in

area, and filled in level. These small crew trucks may be seen frequently and anywhere on the streets, keeping the pavement smooth and sightly.

Portland is one of our most stable cities, reflecting New England's sober attitude toward growth. In the process its utilities and services have kept pace with requirements, both in facilities and administration. So there are no striking novelties in its maintenance. It goes along steadily, without excitement, each year improving a certain number of rough pavements, and moving certain streets up a notch in their progress from dusty roads to cool-looking residence avenues.

It has the best of equipment. The Barber-Greene paving machine is highly efficient. The noiseless Buffalo-Springfield roller is scarcely noticed as it moves back and forth on a busy street. The city uses two Federal trucks for paving mixtures, 6-yd. capacity, with dual rear wheels; one International 7-ton; and one Dodge 4-yd. On big jobs it is necessary to rent trucks, 10 to 12 at a time, usually 6-yd.

Reference to the public makes every job so conspicuously that it makes a traveling engineer stop and wonder. It isn't done like this in most places. Few people hurrying back and forth on Sixth Avenue, and crossing at the intersections, knew that any paving work was being done. Deliberate questioning revealed that down-town office people had not noticed the paving machine or the trucks moving in and out of the work area.

### **What does it Cost?**

Maintenance of the every-day mill-run kind, such as the Sixth Avenue job, costs less than 50¢ a sq. yd. How much less is not to be told. The average overall cost rises to 74½¢ a yard. The cost of laying the 650,418 sq. yds. of paving repairs in 1950-51 was \$484,573, which is the average cost at 74½¢ per yd. More than half of this cost was paid by the utilities and others, and a small percentage profit was added to the actual cost when invoiced to the permit holders.

Funds for maintenance are obtained from a percentage of the state gasoline tax returned to the cities. Incorporated cities in Oregon are allocated 10% of all moneys received by the state in gasoline taxes for their maintenance funds, on the basis of the 1950 census. Portland is penalized for its size, by the influence of smaller cities and rural

areas, and funds are allocated on the basis of only two-thirds of its population.

In the present budget the city council allocated \$100,000 of this money for hard surface patching, and \$102,000 for the re-dressing program. The difference between this total of \$202,000 and the \$484,573 actually spent was paid by The Traction Company, the utilities, and others. The state gasoline tax fund also provided about \$200,000 for maintaining gravel and macadam streets.

Portland feels that its treatment by the state is not fair, for several reasons. Since it is the largest metropolitan area, its streets are used by many people who come from the smaller cities and rural areas to shop and transact much other business. Some of the heaviest traffic never uses the outside highways. The Portland Traction Company, for one example, runs no buses beyond the city limits. It paid \$217,775.95 in taxes on gasoline and diesel fuel in the year ending July 31, 1951, and 95% of this was on gasoline alone.

It seems plain to Portland officials that such figures indicate very heavy city traffic; much heavier than would be required for city residents and business establishments alone. They think the state should return tax money on the basis of 100% of the population in Portland, just as it does in every other incorporated place.

All of this is a family argument, not heard by the visitor to the city. He will see only a checkerboard system of wide and commodious streets well paved and maintained. He will not miss their cleanliness. He will find that the one-way streets give him plenty of room, and the marking and directions are more than usually clear and helpful.

• • •

### **New Chemical Controls Algae in Lakes and Pools**

Extremely small amounts of 2-3-dichloronaphtho-quinone will kill the bloom of blue-green algae but will leave other plant growth untouched, according to an article in Science News Letter by Drs. Skoog, Fitzgerald and Gerloff, botanists of the University of Wisconsin. The chemical is apparently harmless to fish and other organisms usually found in water, but further tests are necessary to determine if this holds true over a long period of time. Meanwhile, the chemical may be used for swimming pools and small lakes.





be moved is then freed on three sides from the adjoining slabs, with particular care taken to free adjoining transverse joints. Material that has become packed into the longitudinal joint as the slab moved outward is also thoroughly removed.

When the joints have been cleaned and the slab is free to move, heavy equipment is brought in. This consists of three 6½-ton winch trucks, using ⅝-inch cable; three sets of 12-inch sheaved blocks; three sets of 12-inch snatch blocks; three sets of heavy steel hooks; and three sets of 2½-inch steel pins with welded braces.

#### **Moving the Slab into Place**

One hook is placed approximately 18 ins. from the end of the slab to be moved while another is placed on the opposite side of the pavement on the slab next to the twin of the one to be moved. This creates a slight diagonal pull against the blocks. The same set-up is used at the other end of the slab. A third set of hooks is

● **ON THIS job, the pavement slab had slipped 2½ ins. Joint was cleaned and slab replaced.**

## How to Correct HIGHWAY SLAB SLIP

**H. L. GRIGGS, JR.**

**T**HE Connecticut State Highway Department has found a simple but successful way to move 60-ton slabs of concrete highway back into position after they have slipped, either or both, sideways and vertically. This problem is pressing on sections of highway laid some years ago in swampy or muddy areas. Over the years, the slabs have slipped as much as four inches from center, dropping on the sides as well. The result is a dangerous gap in the center of the highway as well as an unnatural slope toward the shoulder. Here is the method the department has devised to correct this slippage:

First step is to raise the pavement slabs with mud jacks to within one inch of original grade. The slab to

placed in the center of the slab, with pull exerted straight across the pavement. The snatch blocks are anchored in the pavement. One winch truck is stationed about 100 ft. from the slab to be moved and the other two trucks about 100 and 150 ft., respectively, from the other end of the slab. Slack is taken up on all three sets of hooks, with a slight strain on the cables. When the strain on all three pulling lines

(Continued on page 112)



● **METHOD of replacing slab, showing amount of movement.**



## A 1902 POPULATION AND WATER USE ESTIMATE REVIEWED IN 1952

WHEN Toledo, Ohio, had a population of 131,822 back in 1902, water treatment was in its infancy and there was a marked "public dislike of the water because of its unsanitary character and appearance." The rate of consumption was 63 gpcd. At that time a consulting engineer was retained to study the problem. In his report, made 50 years ago, he had this to say of population growth:

"Basing our calculations conservatively on the growth of these lake cities (Cleveland, Buffalo, Detroit and Milwaukee) and the ratio of growth maintained by Toledo in the past, we estimate the future population as follows:

1910	.....	187,000 (168,497)
1920	.....	252,000 (243,164)
1930	.....	327,000 (320,000*)
1940	.....	412,000 (310,394*)
1950	.....	..... (361,393*)

The figures in parentheses at the right in the table show the actual population; those marked with an asterisk are for the Toledo metropolitan area. Considering the effects of World War I and of the severe depression of 1930-40, neither of which could be foreseen, the estimate was amazingly good through 1930.

The estimate on probable water consumption was also a very good one. The report states: "The . . . low rate of water consumption is undoubtedly due to the general use of meters, 50% of the services being metered, and to the public dislike for the water. . . There can be no doubt that when the water is made clear and wholesome, there will be a great increase in the number of consumers and that the rate per capita will be materially increased."

"Taking this probable increase in per capita consumption into account, we have estimated the average daily amount of water required at stated future periods. We have also estimated the probable maximum daily consumptions for the same periods, these figures being considerably greater than the average, because of fluctuations in consumption at different seasons of the year, on different days of the week, and to meet unusual requirements. These

last figures must be used in determining the capacity of the works . . . except as hereinafter mentioned.

"The average and maximum daily requirements are estimated as follows:

Year	Average MGD	Maximum MGD
1905	12.66	19.00
1910	15.89	23.38
1915	19.64	28.37
1920	23.94	34.02
1925	28.25	40.35
1930	32.70	45.78
1935	36.82	51.55
1940	41.20	57.68

"At certain hours of the day, the rate of consumption is much greater even than the maximum daily consumption. Pure water reservoirs can be used so that the preliminary works can be operated at a constant rate throughout the 24 hours. All parts of the system between the pure water reservoirs and the consumers must be made of sufficient capacity to meet the absolute rate of consumption."

In comparison with the estimate of 1902 shown in the table above, the actual figures for the average and maximum daily consumption are:

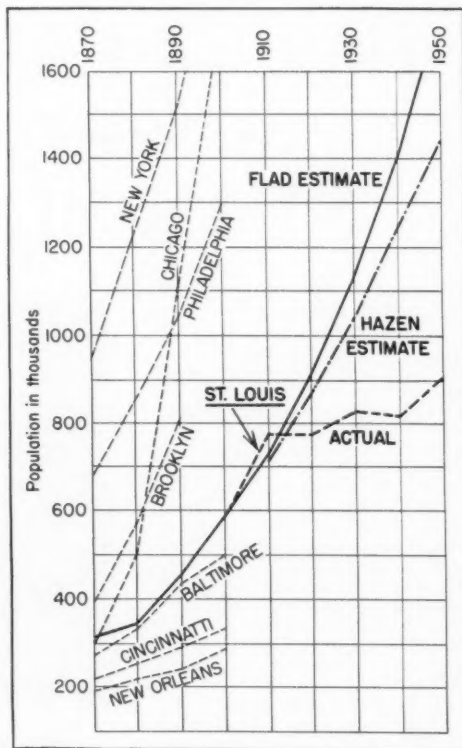
Year	Average MGD	Maximum MGD
1905	11.78	.....
1910	15.59	.....
1915	18.48	.....
1920	25.21	.....
1925	30.25	45.25
1930	36.96	57.69
1935	33.80	49.80
1940	35.50	50.62
1945	46.00	62.47
1950	55.79	77.18

These figures and data were furnished us recently by George J. Van Dorp,

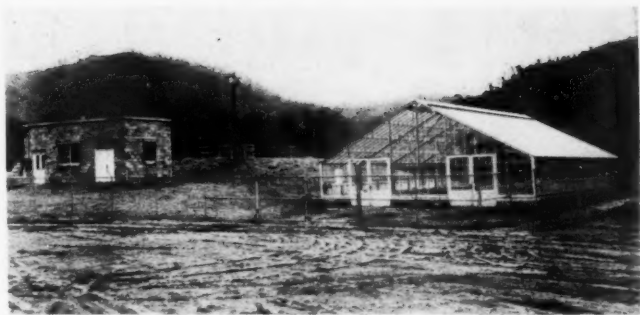
Commissioner of Water, Toledo, and Paul Kiel, Division Engineer. In commenting on them, Mr. Van Dorp says: "In 1940, the population was about 25% below the estimate of 1902, while the water consumption was about 14% below. In 1950, the population was still 12.3% lower than that predicted for 1940, while the water consumption was 55.79 mgd, or considerably above that of the original estimate. This is due to the increase in water consumption to 154 gpcd. The industrial consumption, which is largely responsible for the increase in the per capita consumption figure, has risen from 41% of the total in 1938 to 65% in 1951."

The maximum day consumption (St. Louis data on page 124)

### ● ESTIMATES of 50-year population growth of St. Louis.



**C**ITIZENS of Powhatan Point, Ohio, a coal mining village on the banks of the Ohio River near Marietta, celebrated a milestone of civic progress in January when the town's first sewage disposal system was placed into operation. This included a \$273,000 sewerage system and a \$65,000 treatment plant. The improvements brought to Powhatan Point's 2,300 residents a convenience that has now become a necessity to American life. The sewers replaced 15 private lines discharging to the river, about 100 septic tanks and some 400 outhouses.



● PRIMARY treatment plant, shown above, cost \$65,000.

## DIFFICULT CONSTRUCTION FOR SEWER SYSTEM AND TREATMENT PLANT

DAVID SKYLAR

Powhatan Point's sewage system was a postwar project. In 1946 the village council passed an ordinance banning construction of outhouses. Lack of a sewerage system prevented enforcement of the measure, but the first steps had been taken. Preliminary surveys were made in 1948, with a \$7,000 planning loan from the federal government. With the survey results as a guide, a bond issue for a \$260,000 sewerage system and a \$65,000 primary treatment plant was placed on the ballot in the 1949 election. This was approved by a four-and-one-half to one majority. The consulting engineer was Carl Simon of Van Wert, Ohio.

Because of a good reputation established when the water works bonds were issued, the village encountered no difficulty in selling bonds for both projects. Payment of the bonds has been divided almost equally between sewer revenue for the next 40 years and property tax assessments over a 20-year period. Sewer service rates were established at a \$2 per month minimum.

### Sewer Construction

The contract for constructing the sewer system was awarded the L. Walker Fauber Company of Ashland, Ohio. Construction was initiated in the face of extremely difficult conditions of terrain and of what proved to be one of the most bitter winters in Ohio's history.

The exact length of the lines was not known. It was only known that a town which stretched for two

miles between the river and the hills was to be adequately provided with sewer lines. The original system, as planned, required 56,000 feet of trunk line and 16,000 feet of feeder lines. Both estimates were increased in re-routing because of problems arising from the terrain. Vitrified clay pipe was chosen for all sewer lines.

The system includes gravity flow trunk lines to a point where the Pennsylvania Railroad bisects the

village, almost midway between the river and the hills. Near the railroad, on each side of Captina Creek, are two pumping stations. One of these forces sewage across the creek (through a line constructed on a railroad bridge) to the other pumping station, where the sewage is pumped over a ridge to a point where gravity flow to the disposal plant on the river bank is possible. The force line between the pumping stations is 3,000 feet long, and



● NEW replaces the old. Trenching for a lateral sewer which will replace the unsanitary outhouse shown at the left.



● **TIGHT clay soil in many sections permitted the use of skeleton sheeting for ditches up to 8 ft. in depth.**

the force line from the second station is 2,000 feet long. With the exception of short lines under railroad tracks, the two pressure lines are the only ones in which vitrified clay pipe was not used.

When the project was completed this past January, over 60,000 feet of trunk lines had been constructed of 8, 10 and 12-inch vitrified clay pipe; more than 16,000 feet of 6-inch vitrified clay pipe laterals had been put into use; two pumping stations had been built high above flood levels; 168 manholes had been placed, and 5,000 feet of pressure lines had been laid.

#### **Deep Trenching**

In one portion of the village, a section called Gravel Hill, the greatest terrain obstacle was met. The trenches for trunk and feeder lines were as deep as 18 feet at this point. Appropriately named, Gravel Hill soil was over 90 per cent loose sand and gravel under the top soil. It was on the Gravel Hill lines that ditches as wide as 12 feet caved in.

One employee was caught, and actually buried alive, when the sides of the trench collapsed on him.

Quick action by the crew foreman, who dove into the trench and with his bare hands clawed the earth away from the man's face, was credited with saving the man's life. The worker was hospitalized for two months and never was able to return to his job.

Progress at Gravel Hill was painfully slow. There were 125 feet of trench from 16 to 18 feet deep, all in loose gravel, and it took a crew over a month to cover the distance.

At another point, near Gravel Hill, a line had to be relocated a distance of 3,000 feet, when water was found, although no water had been encountered at a lower level nearby. The re-routed pipe had to be laid on the open ground and covered with earth.

Where deep trenches were necessary, steel shoring was used. A clam bucket was used to dig the trench, and immediately behind it sheeting was driven with pneumatic hammers.

Weather slowed down the project early in the winter. The long Indian summer to which eastern Ohio had been accustomed was negligible, for the day after Thanksgiving, 25 inches of snow blanketed Powhatan

Point. It was not a snowfall that impaired operations—it was a snowfall that stopped construction altogether, and valuable time was lost.

#### **The Treatment Plant**

As work on the sewer lines continued, construction of the disposal plant was started by the Consolidated Engineering Company of Wheeling, West Virginia. The treatment plant consists of a small building housing two pumps and a testing laboratory; an Imhoff tank; and a glass enclosed sludge drying bed.

All sewage flows to a well beside the two pumps, and is then pumped into the Imhoff tank. To avoid flood damage, the tank is elevated and pumping into it is necessary. One of the pumps is 7½-hp, with a capacity of 250 gpm; the other pump is 5-hp, 125 gpm. Both pumps operate automatically. Retention in the Imhoff tank is approximately two hours. The plant was completed in September 1951. John Bednar is Superintendent.

The Village Council has purchased six acres of land about the disposal plant, and may convert the area to a recreation spot later. Plans have already been made for ball fields and picnic sites, and it may be that children can someday swim, unafraid, in the river.

• • •

#### **Snow Removal Keeps All Streets Open All Winter**

**RALPH E. MONSON**

*City Engineer, Rochester, Minn.*

The job on which our equipment was used most effectively last year was probably that of snow removal. We had an extremely heavy fall last winter. This gave our equipment a real workout and proved the necessity for having plenty of dependable machines.

We plow snow with five one-way truck plows; two wheel tractors; and four motor graders. In the business area, snow is windrowed to the center of the street with the motor graders, loaded with a Sno-Go into trucks, and dumped into the river by the trucks, assisted by a power shovel.

Without this equipment, our streets would certainly have been impassable many times last winter. As it was, there was no day during the entire winter when cars could not operate over all the streets of the city.

# A New Method of Garbage Disposal

RALPH J. KENYON

**P**RODUCTION of organic fertilizer is possible from municipal garbage. The humus from the composting process is a marketable fertilizer as it is; but to improve it and to make it a balanced fertilizer, a ground rock phosphate may be added. Digested sewage sludge may also be used as an additive, but it lacks nitrogen and other salts desirable in a fertilizer; it may also, when added in excess, interfere with composting. Therefore, the usual maximum amount of sludge added should not exceed 15% by weight of the volume of ground garbage. Operations of the compostor are all mechanical and are enclosed within a sealed system.

Separate collection of garbage is necessary and it is desirable to have two containers at homes and business establishments in order to prevent any kind of manual sorting operation. Paper in which garbage is wrapped offers no problem; nor do leaves and other organic waste.

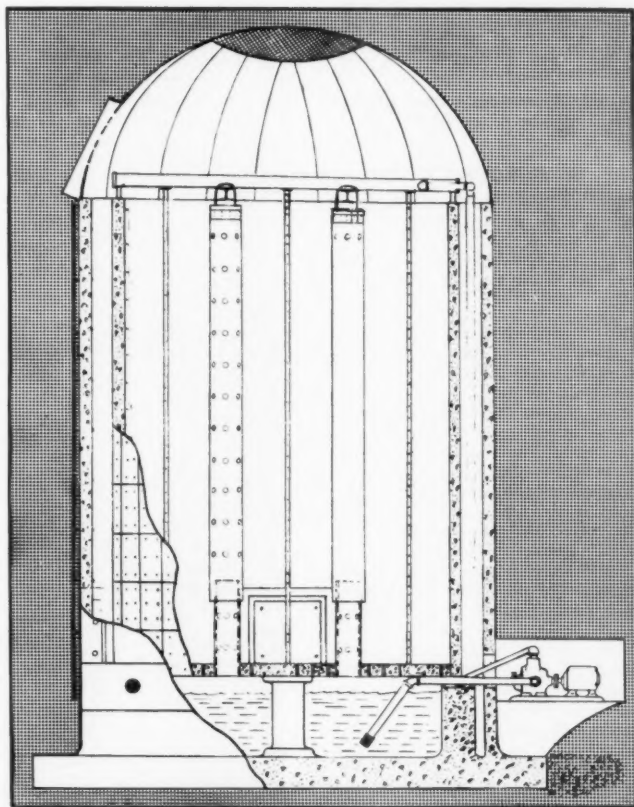
Garbage collection vehicles discharge into a hopper in the grinding house. From the hopper, a belt conveyor carries the waste past an electric device to remove metals which might injure the grinder. Bottles are removed by hand. The waste then passes through a high speed grinder that shreds it into very small particles, enormously increasing the surface area. The ground garbage then passes through a closed conveyor tube to the proper compostor. The return conveyor is also in a closed tube, so that, at no time is the garbage exposed to vermin.

## What the Composter Is

The compostor consists of two concentric concrete silos. The outer one, which has a number of screened aeration ports, serves to insulate the inner one. This inner compostor is constructed of concrete blocks, each having six 2-inch aeration holes. Inside are suspended staves with 1-inch perforations. The floor is a perforated concrete disc designed to allow fluids from the compost to collect in a well beneath. The inoculant consists of a specially developed bacterial culture which is mixed with the liquid in the well. A recirculating pump is provided.

The compostor having been filled

## BY COMPOSTING



● **VIEW through the compostor, showing the well beneath, the recirculating pump and the pipes for applying liquid.**

with ground garbage, the recirculating pump is started and the inoculum is applied to and circulated through the garbage by means of the perforated pipe grid. Excess inoculant and the excess liquid in the ground garbage seep through to the well beneath. The garbage is kept damp but not saturated. Since air is provided, conditions are aerobic.

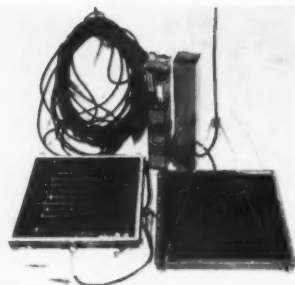
The composting period is usually 28 days. At the end of that time, two valuable fertilizers are available. One is the inoffensive humus resulting from the composting action; the other is the highly concen-

trated liquid fertilizer drawn from the well underneath the compostor. The composting process kills weed seeds and worms and probably other life in the humus including ova.

After the composting process is completed, the vermin-proof hatches at the bottom of the compostor are removed. This clears the bottom of the compostor of all obstructions, permitting the use of equipment to unload the unit. All humus can be removed without manual digging.

All operations from the time the  
(Continued on page 123)





● **BETA and gamma detector for sediments to 90-ft. depth.**

**O. W. KOCHTITZKY**  
and  
**O. R. PLACAK,**

**Acting Chief, Stream Sanitation, TVA,  
and Senior Scientist, USPHS.**

**I**N most production operations there are industrial wastes and disposal methods for them are influenced by their characteristics. Some wastes have a by-product value; others may be objectionable or constitute a hazard to health. Radioactive liquid wastes have no intrinsic value at this time; they are not ordinarily perceptible or objectionable to the senses; normally they have no effect on aquatic plants or animals; and they do not transmit disease. However, the effects they may cause may be no less important to health.

Radioactive liquid wastes are a potential public health problem because continued or repeated exposure by immersion, ingestion or consumption of plants or animals which have concentrated radioactivity from such wastes may result in harmful accumulations in the body. No treatment but natural decay or extreme dilution, without subsequent reconcentration, will reduce these wastes to innocuous levels. All other treatment methods result in a more concentrated waste containing equivalent radioactivity and creating a new disposal problem.

To outline the problem of such wastes in stream sanitation studies, one should be able to predict reliably the ultimate fate of these materials. At the present time this cannot be done. Dispersion may result from dilution, absorption or adsorption. Thus, not only the wastes, but also sediment, aquatic life, both plant and animal, and immersed objects and structures may be in-

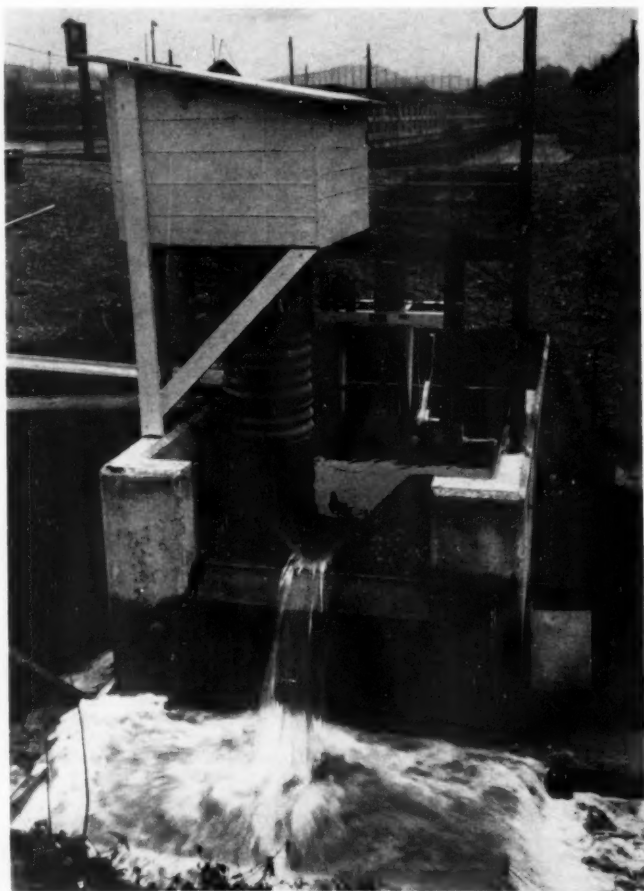
# How to SURVEY RADIOACTIVE

volved. It is not now possible to predict confidently the ultimate fate of all radioactive materials released to nature. The statements made in this article represent best judgment derived from experiences to date. They may be modified by added knowledge, new instrumentation and improved techniques.

Radioactive materials in a stream must originate from one or more

of the following: 1. Naturally occurring radioactive materials; 2, operating nuclear reactors; 3, hospital or research institutions; 4, industrial users; and 5, an atomic explosion.

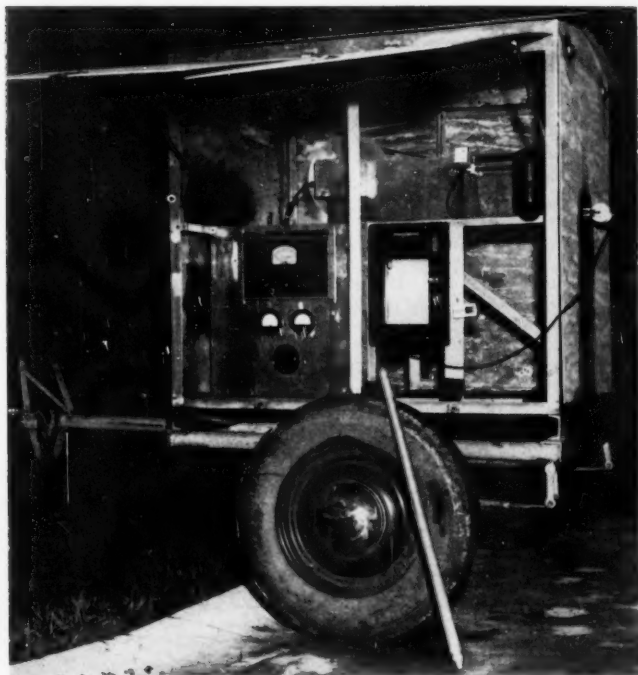
Natural background radioactivity is a baseline to which all survey studies have to be related. Experience has shown that the amount of radioactivity in certain normal rocks and waters is:  $0.05$  to  $5.0 \times 10^{-6}$



● **WEIR box, with continuous water level recorder and Trebler proportional sampler, discharging to container shown at right.**



# a STREAM for SUBSTANCES



● **GAMMA well-logging probe records activity in counts per minute on strip chart and is trailer-mounted for mobility.**

$\mu\text{c/gm}$  for continental rocks, with granites in the highest scale (0.2 to 5.0) and sedimentary rocks in the lowest scale (0.05 to 0.5); 1 to 22  $\times 10^{-6}$   $\mu\text{c/gm}$  for ocean bottom sediments, with red clay highest (3 to 22) and blue and lowest (1 to 3); and 0.08 to  $3.9 \times 10^{-6}$   $\mu\text{c/gm}$  for water, with surface water ranging from 0.36 to 3.41, ground waters from 0.58 to 3.90 and sea water averaging 0.08.

Operating nuclear reactors and associated processing plants are, at present, the greatest sources of radioactive wastes, both in quantity and variety. Information on these may be definitely limited. Hospitals, research institutions and industries should fit into a normal stream study program, with data on their wastes quite readily available. In general, they will use specific, or a

limited number of, isotopes which will simplify interpretation of results. Atomic explosions are atypical and will not be considered here.

## Difficulties in Stream Surveys

When wastes containing radioactive materials are present, these must be fitted into the stream survey pattern. Some practical difficulties will occur, including the following.

1. Data of an essential nature may be unavailable.
2. Since knowledge concerning physiological and biological factors and the role that radioactive materials may play in biological food chains is incomplete, maximum permissible concentrations are tentative.
3. Techniques and analytical methods have not been completely

developed and are not fully standardized.

4. At the concentrations likely to be found, chemical analyses may be impracticable and interpretation of results uncertain.

5. No adequate backlog of information is available since many of the elements were previously of small concern.

6. Trained personnel is lacking, which requires that those engaged in stream survey work must be given special training.

## The Fate of Radioactive Materials

We cannot state exactly and quantitatively the ultimate fate of the radioactive materials that might enter a body of water. The sole positive and permanent form of removal is by natural decay. Physical removal from the water may be accomplished by mechanical or chemical precipitation; adsorption by biological organisms; adsorption on surfaces such as clay particles; deposition on underwater structures; assimilation into plants; or by a combination of several of the above. However, regardless of the manner of removal, the end results are new foci of radioactive materials which require investigation and evaluation.

The radioactive contaminants remaining in the liquid phase and, to some extent, those adsorbed, concentrated or deposited, might create a public health problem. The magnitude varies with the isotope and will depend on concentration, biological and radioactive half-life, energy and type of radiation, chemical properties and the critical organ in which the radioisotopes may concentrate.

If this water were treated, as for domestic use, some removal could be expected. The efficiency of removal varies with the isotope and probably ranges from 95% to 100% with  $\text{P}^{32}$  and the rare earths to less than 10% in the case of  $\text{I}^{131}$  and  $\text{Sr}^{90}$ . In the case of efficient removal, the end result is contaminated sludges. In the case of small removal, there will be an ingestion hazard. If contaminated water were to be used as industrial or process



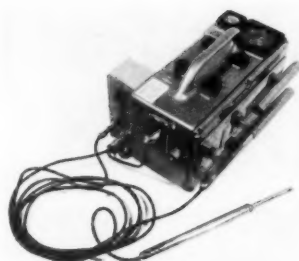
water, the possibility of contaminating equipment and products must be considered. One example would be the use of such water in the manufacture of paper to be used for packaging photographic films.

### Supplementary Samples and Analysis

When radio-active contaminants are present, physical and biological samples which ordinarily would not be collected are more significant. For instance, microscopic organisms, plankton and algae, may concentrate radio-active isotopes by a factor of several thousand over their water environment. When these organisms are utilized as fish food, radio-activity may build up in the flesh, bones and scales of fish. Samples examined downstream from Oak Ridge National Laboratory, showed concentrations in bones and scales of fish to be 5 to 10 times as great as in flesh.

Microscopic organisms as fish, worms, snails and aquatic animals, can be examined for radiation damage or assayed for absorbed radio-active substances. Aquatic vegetation should also be examined for radioactivity.

Suspended solids or bottom sediments, in general, adsorb radioactivity and may have concentrations in excess of the liquid phase. Such radioactive solids may settle out, be removed in water treatment plants,



● **FISH probe. Fish can be held under water, monitored for radioactivity and released unharmed.**

or build up in recreation areas. It is possible for the concentration of radioactive contamination to occur in the flocs and sludges of water and waste treatment plants and in the slimes and sediments of pipes, conduits and other structures. Examples of the effectiveness of water treatment processes are shown in Table 1.

### Instrumentation and Analysis

Radioactivity cannot be detected visually or chemically; electrical or photosensitive devices are required, and these are complex and expensive and require judgment in operation. Various instruments devised or adapted for detecting or measuring radioactivity are shown here-

with. Continuous monitoring would be desirable but algae and turbidity tend to accumulate on the detector and invalidate the results. For this reason, continuous sampling may be employed.

Most analyses in a stream survey program will consist of gross counts of the mixture of isotopes that may happen to be present. For gross analysis, a sample of small thickness (of the order of milligrams per sq. centimeter) to minimize self-absorption is deposited on a dish or disk, exposed to a counter and the total count for a definite time interval is determined. A gross count from a mixture of isotopes of different energies will require careful interpretation to evaluate in such units as microcuries per cc. The level of radioactivity in these samples will usually be low, and no counter will count all disintegrating atoms. Therefore, many samples will have to be concentrated by evaporation, precipitation or other means. The level of activity will determine the sample size. In some cases it has been necessary to concentrate as much as 50 gals. of well water and 300 gals. of rain water to obtain significant counts.

Counting tubes with different absorbers or of different wall thicknesses will discriminate between the several types of radiation. Thus it is possible to screen out betas and count only gamma activity. Special

(Continued on page 114)

**TABLE I—REMOVAL OF FISSION PRODUCT RADIOACTIVITY**

Test Material	Coagulant	Maximum Removal Per Cent	Basis of Test
<b>A. Conventional and Average Water Treatment Processes</b>			
Dissolver Solution <sup>(a)</sup>	Al	84.2	Jar Test
Dissolver Solution	Fe	83.7	Jar Test
Mixed Fission Products <sup>(b)</sup>	Fe	85.9	Large Scale Plant
Mixed Fission Products <sup>(c)</sup>	Al	73.0	Model Plant
W-6 Wastes <sup>(d)</sup>	Fe	29.0	Large Scale Plant
<b>B. Non-Conventional Processes</b>			
Dissolver Solution <sup>(a)</sup>	Calcium Phosphate	99.2	Jar Test
Dissolver Solution	Calcium Phosphate, 100 ppm + clay	99.4	Jar Test
Mixed Fission Products <sup>(b)</sup>	Fe + 1000 ppm clay	89.4	Large Scale Plant
Mixed Fission Products	Fe + 1800 ppm Carbon	90.2	Large Scale Plant
W-6 Waste <sup>(d)</sup>	Fe + 1800 ppm Carbon	38.6	Large Scale Plant
W-6 Waste	Fe + 1000 ppm Clay	81.7	Large Scale Plant
W-6 Waste	4400 ppm Clay	88.0	Jar Test

(a) Potential wastes from a nuclear reactor.

(b) Simulates conditions after a bomb blast.

(c) Similar to (b) with the percentage of hard to remove Ru, I, and Sr increased.

(d) Predominately Cs and Ru for which low removals can be expected.

# 10 Ways to use HERBICIDES to Control ROADSIDE VEGETATION

A. LEPORE,  
Chemical Insecticide Corp.

**T**HOUGH the use of chemicals for controlling weeds and woody plants has become an established practice, chemical weed control is still in its infancy. A great deal of experimental work remains to be done not only in better usage of present herbicides but also in the development of new and more effective chemicals. However, sufficient data have been accumulated so that available chemicals for the control of weeds and woody plants can be used with confidence.

Up to several years ago, that is, prior to the advent of the use of plant growth regulators as weed killers (2,4-D and 2,4,5-T), most brush and weed eradication had to be done by mechanical methods, such as cutting and mowing. These methods were expensive, required a great deal of manual labor and were not too satisfactory. For example, the cutting of branches from a tree or shrub did not kill the plant, since the shoots were soon replaced and the process of cutting had to be repeated.

On the other hand when such herbicides as 2,4-D and others are applied to susceptible vegetation, the entire plant is killed right down to the roots. In many instances one or two applications will bring about a complete kill.

## The Killing Mechanism

Contact poisons, such as sodium arsenite, which we call Chem-Sen, and volatile oils, when applied to a plant, poison the plant cells and thus effect killing. The plant growth regulators, however, do not kill by poisoning the plants. Scientists have found that 2,4-D stimulates certain physiological processes within the plant with the result that food reserves are depleted before they can be replenished. The plant thus ceases to exist as a living organism. Since the leaves manufacture the plant's food by the process of photosynthesis and since the chemical is readily absorbed by the leaves and stems, the time of application of the chemical is important if good results are to be obtained. The fast-growing stage of the plant is perhaps the most vulnerable one.

Generally speaking, 2,4-D will kill



● **POWER** equipment provides high speed spraying for roadsides.

most broad-leaved vegetation, but will not kill narrow-leaf plants, such as grasses and grains. There are, however, quite a few of the woody plants which are very resistant to 2,4-D, including the maples, the oaks and poison ivy.

There are three general formulations of 2,4-D: The esters, the amines and the sodium salts. The ester formulations are the strongest of the three and the most volatile. They are more effective than the salt formulations, but they are more hazardous to use adjacent to crop areas. Where the vegetation along the right-of-way includes broad leaved weeds and 2,4-D-susceptible brush, such as willow and sumac, then 2,4-D can be used. In most instances, however, where there is brush it may be wise to use a combination of 2,4-D and 2,4,5-T.

## Other Weed Killing Compounds

Because it will kill some woody plants that are not killed by 2,4-D, 2,4,5-T has a definite place in a woody plant control program. This material, as in the case of 2,4-D, is prepared as ester and amine formulations. Both 2,4-D and 2,4,5-T will kill most broad leaved weeds and shrubs but have practically no effect on grasses, once they have emerged. Sodium TCA (sodium trichloroacetate) is a grass killer, killing not only the vegetative portion of the grasses, but the roots as well. It leaves a toxic residue in the soil, which may persist for several months, depending principally on the amount of rainfall following application. Where grasses in combination with woody shrubs and/or broad leaved weeds must be con-



● **FOLIAGE control applications are made when plants are in full leaf and well before frost.**



● **WEED control along roadsides can be accomplished quickly with equipment such as this.**

trolled, then TCA in combination with 2,4-D or 2,4,5-T, or with the latter two combined, can be used for eradication.

Sodium arsenite (Chem-Sen) is a highly concentrated liquid sodium arsenite compound that is used for soil sterilization. It should be used only where the toxic residue remaining will not endanger humans, animals or valuable plants or trees. Since it is an arsenical compound, it is extremely poisonous and should be stored in a protected place. Its use results in soil sterilization.

#### **Foliage Applications**

For general spraying of mixed brush population, (mixed brush, brambles and poison ivy) a combination of 2,4-D and 2,4,5-T has been very satisfactory. This mixture can be applied as a foliage application, as a basal bark treatment or directly to stumps to prevent these from sending out sprouts. It is widely used in eradicating brush and/or weeds from rights-of-way. For foliage application, this brush-killer formula should be applied when the plants are in full leaf. The application should be made not later than three weeks prior to frost date. For most effective control, it is necessary that the leaves, stems and bark are covered thoroughly. Power or hand sprays may be used.

Our brush-killer compound contains two pounds of 2,4-D and 2 pounds of 2,4,5-T acid equivalent per gallon. For good results, one gallon of this compound may be diluted into 100 gallons of water for

foliage spraying. In other words, use four pounds of acid equivalent of the brush-killer formula with 100 gallons of water.

#### **Bark and Stump Treatment**

For basal bark treatment, to treat mixed brush in dormant seasons, the compound is applied during the dormant stage, preferably in the late winter or early spring, to the stems from the ground line up to 12 ins. above ground. This area should be wetted thoroughly on all sides until run-down of the spray is noticeable. In this treatment, oil is used as a carrier instead of water. Either diesel oil or fuel oil is satisfactory. Sprayers with low spray pressure should be used. A suggested concentration is as follows: Use 1.5 quarts of our brush-killer compound to 6 gallons of diesel or fuel oil.

Stumps can be treated with this same brush-killer mix to prevent them from sprouting. The entire stump should be wet thoroughly to the ground, the amount of spraying being such that runoff is noticeable. The concentration to be used will be the same as for basal bark treatment.

As previously stated, TCA is an herbicide which is specific for annual and perennial grasses. It is effective for the control of established stands of quack, Bermuda, Kentucky blue and brome grasses when applied at the rate of 80 to 100 pounds per acre, Johnson grass is more difficult to control, but satisfactory results have been obtained with 100 to 150 pounds of TCA per

acre, the TCA being mixed with water and sprayed uniformly over the grasses. Residual toxicity occurs and may persist for several weeks to several months.

For treating soil to prevent vegetative growth, a dilute solution is applied. This is made by mixing a half of a gallon of sodium arsenate (our Chem-Sen) with 4.5 gals. of water. The resulting 5 gallons will cover one square rod of soil. If the area to be treated is dry, it is advantageous to wet the soil before applying the agent. If the area to be treated is covered with weeds, it is preferable to remove all surface vegetation before treatment, so that the spray can be applied directly to the soil.

Results obtained with a single treatment will vary with soil types and subsequent rainfall. In most cases it will be necessary to make a second application within six months to a year. Later treatments will be necessary as the arsenical residue is reduced.

It must be borne in mind, when using the herbicides, that most garden crops are very sensitive to them. This is especially true of the plant growth regulators, such as 2,4-D. Very small drifts of these sprays can cause severe damage, if not outright kill, to certain vegetables and even to fruit trees.

There are other herbicides, not discussed in this article, which are being used effectively to control specific vegetative pests. In using these, satisfaction will be attained by following closely the recommendations of the manufacturers.



# NEW YORK makes careful EQUIPMENT MAINTENANCE PAY

THE shop foreman wasn't joking when he said, Boys, the machine is finished. Now we will start to fix it." From the moment a piece of equipment is delivered and put into service, the forces of deterioration go into play and the never-ending maintenance struggle to keep it rolling begins. This maintenance problem is aggravated during times of stress such as we are now going through. Equipment and spare parts are hard to get. More rapid wear has resulted from a reduction in material quality due to the omission of valuable alloy metals such as chromium and nickel which are reserved for the defense effort.

## HENRY LIEBMAN

Director of Operations

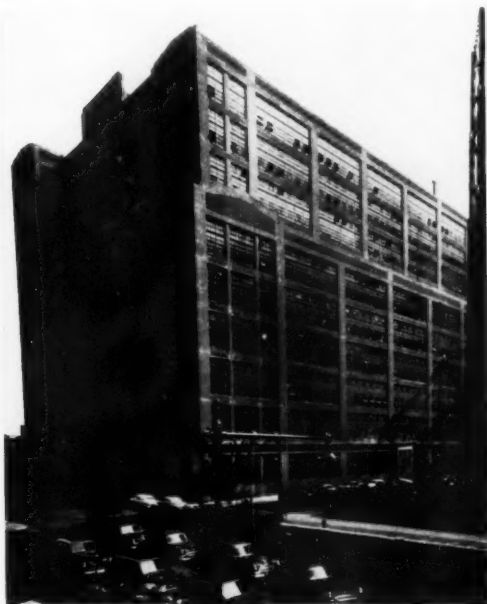
Dept. of Sanitation, New York City

To maintain its large truck fleet which covers thirteen million miles of city driving a year, and all other equipment that the Department of Sanitation of the City of New York operates, is a difficult problem even in normal times. During the past two decades war, depressions, budgetary limitations and preparation for defense have interfered with any rational equipment replacement programs. Consequently, at the present time we are faced with a

condition where half of our units are more than ten years old. An active program of equipment replacement was started about three years ago and approximately 840 new collection trucks in addition to other equipment have been secured. During this time about 400 obsolete pieces of equipment were condemned, stripped for usable parts and sold as junk.

### Maintenance Responsibility

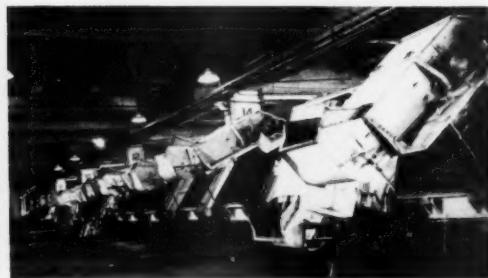
The responsibility of maintaining the 3,700 pieces of equipment owned by the Department of Sanitation rests in its Bureau of Motor Equipment. It is charged with repair, alteration and maintenance of motor



● THIS building houses main repair facilities.



● MACHINE shop performs major motor repairs.



● PREVENTIVE maintenance keeps trucks going.



equipment; initiating specifications and requisitions for all new and additional motor equipment and appurtenances; conducting road and factory tests of new equipment and making factory inspections; maintaining all necessary records for reporting on costs and availability status of all equipment; prescribing methods and procedures for repair and making all field repairs required; and maintaining stock, spare parts, replacement units and assemblies.

In order to perform its job a staff of approximately 800 auto mechanics, machinists, laborers, upholsterers, battery men, tire repairmen, welders, blacksmiths, clerks, stenographers, foremen and other supervisors is employed. In addition to the large staff needed for this task, the budget provides about \$2,600,000 for automotive supplies, motor vehicle materials and repair parts, and other miscellaneous items. Of this total, about \$1,200,000 is for gasoline and about \$100,000 for oil. Tires and tubes amount to \$410,000; engine parts \$190,000; and, the other large item, body parts is \$200,000. Accessories and other items make up the balance.

The Bureau's activities are concentrated mainly at the huge Central Motor Repair Shop. This is a ten-story concrete plant, built about twenty-seven years ago and is located on Avenue C and 16th Street, in the Borough of Manhattan. Distributed throughout the building are twenty functional sections devoted to maintenance and repair. These sections include the follow-

ing shops and sections: Carpenter, Electrical and Battery, Chassis Repair, Body Repair, Forge and Welding, Machine, Sheetmetal and Radiator Repair, Motor Rebuilding, Spring Repair, Upholstery, Broom, Passenger Car Maintenance, Preventive Maintenance, Salvage, Parts Storage, Office, and Engineering. The Bureau also operates heavy equipment shops in Elmhurst, Queens, and Fresh Kills, Staten Island.

### Shop Equipment

The Machine Shop is well equipped with all types of machine tools required for the work. Among the more important units are lathes, grinders, milling machines, shapers, drill presses, crankshaft grinders, boring machines and hydraulic presses. These machine tools are used in the general overhaul and rebuilding of major replacement units such as clutches, transmissions, differentials and the fabrication of shafts, gears, etc.

The Motor Rebuilding Shop contributes greatly to the success of the maintenance program. Complete power units from the small passenger car motors to the largest diesel engines are dismantled, cleaned in the degreasing tanks, inspected and all necessary repairs and replacements made. There are machines for reboring cylinders, grinding crankshafts and all other necessary work. Upon reassembly, units are given the standard factory test. When all necessary adjustments are made they are either re-

installed or placed in storage for future use.

The Forge, Blacksmith and Welding Shops are outfitted to do all the forging, welding, straightening, sheetmetal work and repairing necessary to maintain the equipment. A gas fired furnace and two steam driven hammers are used to forge parts that are unobtainable or that can be more economically manufactured in the shop. All welding work is performed here with the aid of complete gas and electric welding machines. Large bending brakes handle the sheetmetal problems.

The Battery and Electric Shop includes a main charging room for truck and car batteries and can accommodate 168 batteries in a twenty-four hour period. There is another room which accommodates 72 batteries at one time and is used exclusively for storing and charging the batteries in snow removal equipment. Batteries are rebuilt and repaired in the Battery Shop. In the Electric Shop all electrical units such as starters, generators, regulators, etc., are repaired and defective parts replaced. All the necessary electrical testing devices have been installed.

The Tire Repair Shop contains devices for inspecting and repairing all tires except those casings requiring extensive vulcanizing work which are done by an outside contractor. During the year, approximately 20,000 tires and tubes are repaired and remounted. As many as 100 to 150 flat tires a day are experienced. Damaged tires are care-



● **BUMPERS** get bent in New York's traffic and carburetors need attention and adjustment.



● **FORGE** and welding shop can make parts that are difficult to obtain. Equipment is complete.

fully inspected, using the pneumatic tire spreader. Cuts and punctures are responsible for most of the tire damage. A roving inspector checks on tires in service, particularly to detect underinflation. All new tires are branded and complete records kept of each tire during its life. Devices for speedily removing tires from their rims have been invented by our own personnel and have been copied and used elsewhere.

The Carpenter Shop is provided with circular and band saws, plane and miter machines, cutters, sanders and other tools used to repair and reconstruct truck cabs on those units which still have the wooden frame cabs. The newer units are all metal cabs and the activities of this shop will be diverted to other carpenter work in the future.

The Preventive Maintenance Section is equipped with pressure lubricating devices, testing machines and hydraulic lifts for performing maintenance operations as expeditiously as possible. This section is divided into two units, one for passenger vehicles and the other for trucks.

The Engineering Section personnel observe the performance of equipment, makes studies of mechanical failures, devises improvements, runs tests and prepares plans and specifications for new equipment. Many new innovations and developments in refuse collection trucks, mechanical street sweepers and snow equipment have been produced by this section in collaboration with the Commissioner's Staff Section of Engineering headed by

C. A. Rogus, Director of Engineering.

Heavy duty equipment such as tractors, bulldozers, cranes and draglines which are utilized in the operation of landfills are repaired at the Elmhurst Shop. Marine fill equipment, Athey Wagons and marine diggers are taken care of at the maintenance shop incorporated in the Fresh Kills Marine Unloading Plant in Staten Island.

### Preventive Maintenance

Preventive maintenance is the backbone of any program to keep equipment in reliable operation. Of all PM measures, lubrication is the most important. All Sanitation units are completely lubricated once every thirty working days. This time interval, rather than a mileage factor, was selected since collection truck fleets, as a rule, are low-mileage fleets. Mileage covered ranges from 500 to 1,500 miles per unit in this period. Approximately one-half of all the collection units, about 830, comprising mainly the new vehicles and 120 passenger cars, are serviced at the Central Motor Repair Shop. The others are taken care of at their respective garages. Schedules are prepared in advance enabling the operating force to know which vehicles will be out of service.

The PM procedure at the Central Motor Repair Shop has been developed over a period of years. Upon arrival, a truck is checked for cleanliness and routed to its allotted space on the floor. The regu-

larly assigned driver brings the truck to the building and stays with it throughout the day. This has a distinct advantage in that he is well acquainted with the unit and is able to inform the mechanics of any troubles that have developed during its operation. In addition, he lubricates the unit while it is being checked. The mechanics proceed to make their inspection noting on a standard form all corrections that need to be made. If the work necessary will require more than one day, the truck is then sent to the major repair section or scheduled for return at such time as space is available in the major repair section.

The inspection procedure and PM service now in practice is as follows:

1. Lubrication—chassis and accessories. This is done by the regularly assigned driver of the vehicle.
2. Electrical System check—sparkplugs, distributors, wiring, transmissions, horns, lights, signals, voltage regulator, battery, starter and generator, speedometer.
3. Oil and Fuel System check—carburetor, fuel pump, strainers, oil filter, oil levels and condition, air cleaners, gas and oil leaks.
4. Cooling System check—radiator hose and connections, fan and fan belt, water pump.
5. Brake Systems check—air compressor, air receiver, valves, air cleaner, service brakes, parking brakes, hydraulic brake fluid level.
6. Body and Cab check—doors, hinges, locks, glass, cab body, up-

(Continued on page 96)



● BATTERIES are rebuilt and recharged and electrical equipment repaired and adjusted.



● BROOMS wear out rapidly under daily use and new bristles must be inserted in them.



**J. WILEY FINNEY, JR.,**

Chief Engineer, Div. of San. Engrg.,  
Tennessee Dep't. of Public Health.

**F**LUORIDATION of a public water supply is subject to the approval of the Department of Public Health, and regulations have been issued governing such installations, including the procedure for obtaining approval. The factors on which approval are considered are covered in a paper by the author before the Tennessee State Dental Society on which the following is based. It is the responsibility of the Sanitary Engineering Division to determine if competent operating personnel and satisfactory equipment are available to insure proper water treatment procedures. We feel that before approval of fluoridation can be granted there must be a record of satisfactory water system operation and maintenance. We do not believe that the installation of fluoridation equipment will convert sloppy, half-hearted operation and maintenance into efficient practices. We believe that fluoridation is an important milestone in water treatment and are unwilling to allow installations where poor operation might jeopardize the success of the process.

Since 1939, this Division has carried on a rating and approval program for public water supplies whereby the systems are rated numerically. When a system attains a rating of ninety points or more signs reading "Public Water Supply Approved—Tennessee Department of Public Health" are erected at the city limits on all state highways entering the town. Since approval status indicates a high degree of attainment in the equipment, operation and maintenance of the water

plant and system, the approval of the system has been made a criterion for the approval of the fluoridation process. Therefore one of the first steps in the promotion of fluoridation for a public water supply is to determine if it has approval status under the rating program and if not, to take the necessary steps toward obtaining needed improvements to the system.

#### **The Rating System**

The rating system is based on the evaluation of physical equipment and facilities, operation and maintenance of equipment and facilities, and final water quality. It is recog-

nized that the operation of the fa-operator or superintendent carries a credit of nine points in the rating.

The number of approved water supply systems has increased from 33 in June, 1941, to 92 at the present time. Better than 82% of the people using public water supplies are served by the 92 approved systems. Since there are 228 public water supply systems under supervision it is apparent that many of the small systems have not reached approval status. The size of the system is not a bar to approval and recently a supply serving a community of 176 people received approval signs. Improvements needed to increase the rating of a water supply are not always costly and often the major causes for non-approval are lack of interest on the part of officials and operating personnel. A recent survey of the first fifty non-approved water systems according to alphabetical listing indicated that three would be ready for approval at the time of the next visit; twenty-six need operator certification, improved operation and maintenance, control of cross connections, or improvements costing less than \$100; the remaining twenty-one might require an expenditure of funds exceeding \$100, as well as improved operation and maintenance. On the

## **OUTLINE OF TECHNICAL CONSIDERATIONS**

cilities plays a major role in the continuous production of a safe water and a total of 38 points in the rating applies to operation and maintenance; 42 points apply to physical equipment; and 20 points apply to final water quality covering physical, chemical and bacteriological characteristics. In order to improve the operation of water plants and systems the Division began a program of operator training many years ago and a voluntary certification plan was added at the time the rating and approval program was put into operation. In order to obtain a Certificate of Competency the operator or superintendent must meet certain education and experience requirements and pass a written examination. The first and second certificates are valid for a two-year period and the third certificate is permanent. The certification of the

basis of this sample it is reasonable to believe that 58% or 78 of the unapproved systems can be added to the approved list without appreciable financial outlay.

#### **Installing Fluoridation**

The technical considerations in the installation and operation of fluoridation equipment are not appreciably different from those in other water treatment processes. The same types of chemical feeders can be used with certain modifications for feeding fluorides. Sodium fluoride and sodium silicofluoride may be measured and fed by means of dry chemical feeders or solutions of these chemicals may be prepared in batches and measured and applied to the water by means of solution feeders. Hydrofluosilicic acid is measured as a solution and may be

(Continued on page 100)



## Who is the wholesaler's salesman?

The man whom we want to talk about here is the individual who contacts you—the buyer. He is either an "outside" salesman who calls on you, or one who waits on you at his salesroom.

He may be the owner of the establishment, who, by choice, likes to serve you personally when you come in; he may be a salesman who takes orders over the counter; or he may be one of many salesmen representing the firm from which you buy.

That salesman who contacts you is perhaps better posted about the products he sells than anyone else in his organization—because his daily operations bring him in closer contact with his customers. This continuous association—rubbing elbows with countless numbers of customers, all striving to satisfy their own particular demands—can't help but create within that salesman a storehouse of valuable knowledge.

Possessed of this wealth of information, the wholesaler's salesman can be—and should be—your "right hand man." Because he "gets around," he knows a great deal about application activities of the many products his customers use. He learns what you like and dislike. And as a consequence, others in his organization lean on the salesman's judgment in selecting products which he thinks would win highest approval from you and the wholesaler's other customers.

In the case of tubing, for instance, nearly all his customers express a preference for Wolverine. Buyers of this product have learned through experience that there is a difference in tubing and have recognized in Wolverine the high quality and dependability they want.

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## REPORTS from the FIELD

### Better Methods and Equipment

WE HAVE SAVED LABOR with our front-end loader, chain saw and air tools. A thing we like about our loader is its long reach which enables us to load windrowed material from in rear of the truck. We use considerable specialized equipment.



Lull shovel on Minneapolis-Moline tractor, Wyandot Co., Mich.

We plan to keep our crane busy on bridge work all season; and our distributor and patching rollers on maintenance and betterment. We use our motor grader on ditch and berm work almost continuously, and our FWD truck with underblade to maintain our stone and gravel roads and to pull brush in the fall. —A. J. Moon, County Engineer, Upper Sandusky, Ohio.

OUR TRUCK-MOUNTED crane, which is a ½-yd. Hanson, has been used effectively to load gravel, clean ditches and drive piling for bridges. —Knight Laird, County Surveyor, Jonesboro, Ark.

A WOODS PREPARIZER saved us a considerable amount of time this past year as we had many oiled roads that were damaged during the winter which had to be torn



Woods Preparizer used by Cascade Co., Montana.

up for reconstruction. Our York rake also saved us much time and money in removing the oversize gravel from the roadway and removing it to the road shoulders where it could be utilized. This was rolled into the shoulders with a 10-ton roller. — Carl Lemmer, County Surveyor, Great Falls, Mont.

ON NEW MAIN construction we used a Barber-Greene ditcher and an International 14 tractor with Ottawa loader and blade to very good advantage. —Garvin H. Dyer, Mgr., Missouri Water Co., Independence, Mo.



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it that it is hard to pick any outstanding one. In addition to all its other work, it gives us a very good snow plow, as we have a V-type plow that replaces the 1½-yd. shovel.—Wm. Cone, Jr., Highway Superintendent, Flandreau, So. Dak.

WE INSTALLED 4,000 ft. of 4-inch cast iron pipe along the shoulder of a State Highway. We used a power shovel for excavation and a Case wheel tractor with a shovel loader for backfilling. For making taps across the highway, we used a Ka-Mo boring machine, thus avoiding cutting the pavement.—E. J. Van Deusen, Sup't. Water and Sewers, Malone, N. Y.

A BACKHOE was used for laying a new water main. Our tractor has an end-loader at one end and the backhoe at the other. A Ford tractor is also used for digging out mains in case of breakage or joint leakage. We now have equipment that will replace the end loader for backfilling and can also be used for snow removal.—Karl J. Fuss, Public Engineer, Mattoon, Ill.

WE HAVE found the Fordson backhoe the best for hydrant repair. Used properly, we can dig and lift out the hydrant, pick up the replacement hydrant from a truck, and set it into place in a very short time.—Richard E. Baum, Water Works Sup't., Mount Prospect, Ill.

EQUIPMENT USED included: For laying water mains an Austin-Western Badger ½-yd. backhoe; for services and small mains (2-inch), a Henry hydraulic backhoe; and for cleaning sewers and drains, Flexible sewer cleaning equipment.—H. C. Lightfoot, Sup't. Water & Sewers, Payette, Ida.

*What does the Price  
 Tag Say?*

**\$500000 the  
 COST OF BLIND  
 DIGGING**



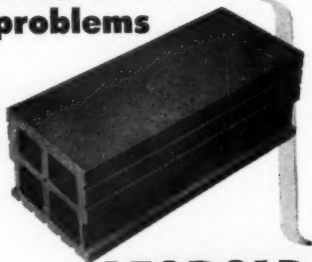
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## Ever dig up the same joint twice?

Then you've paid out more than the price of a permanent repair—*without getting permanence*. Recaulking may stop the leak temporarily, but it leaves you with a joint no better than the one that failed. It does nothing to combat the cause of the trouble.

That's why more water men every year are making it standard practice to repair all leaking bell-joints permanently with Dresser Style 60 Clamps. Style 60's are *flexible-tight*. Their resilient gaskets harmlessly absorb stresses which would cause repeated failures in rigid joints.

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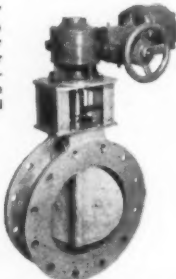
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"Kwikleen" slide valve with air cylinder operator; for handling carbon shapes in a hopper feed system.

Butterfly valve with electric motor and declutching mechanism for emergency handwheel operation; for handling water at 25 p.s.i.



Stainless steel butterfly valve for welding into pipe line; with air diaphragm operator and valve positioner; operation at 1600° F.



MOTOR GRADERS are used to clean and dig ditches, cut weeds on highway shoulders, mix and lay bituminous surfacing, and rip up old surfacing. We also have a front-end tractor loader and two chain saws. We have devised a traffic striping machine that is also a combination water wagon, water pump and fire fighter—Carl F. Lind, Road Com'r., Sutter Co., Calif.

EQUIPMENT USED BY Autauga Co., Ala., includes two 8-yd. pans; three crawler tractors; one wheel tractor; one bulldozer; one sheep-foot roller; flat wheel rollers; heavy-duty motor patrol; chain saw; power spray and other units. "All are equally useful."—F. G. Charlton, County Engineer.

WE CONVERTED a good 1939 Dodge truck into a hoist truck with power winch and movable 20-ft. boom. Our best piece of auxiliary equipment is a 5-ton Diamond T tractor with a 24-ton lowboy for moving tractors and cranes and hauling bridge materials, which range from 20 to 32 ft. long—Clarence G. Stephens, Highway Sup't., Pennington Co., So. Dak.

THE RUBBER - MOUNTED trench backhoe, together with the rubber-mounted front-end Pay-loader, made a good team for laying over 20,000 ft. of water mains last year.—Fred E. Thrall, Acting Superintendent, Manchester, Conn.

IN A 4,000-gpm booster pumping station about 5 miles from our filtration plant, we installed equipment for remote control, including metering, monitoring and reporting by phone. This plant operates without manual attention.—G. Leland Watson, Sup't., Water Department, Lake Forest, Ill.



Houghton Co., Mich., uses this heavy plow to meet winter needs. E. F. Winkler is the County Highway Engineer.

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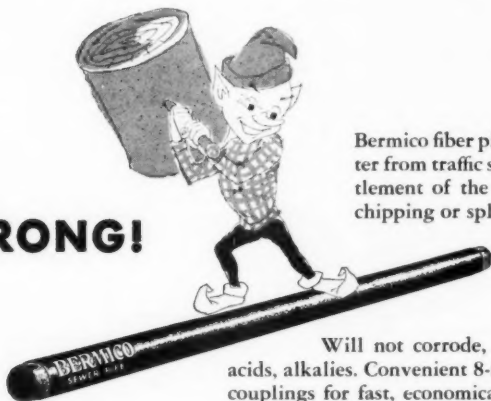
Bermico fiber pipe has tapered sleeve joints which are root-proof, water-tight, will not pull apart or get out of alignment. A few hammer taps seal joints permanently, and no joining compound is needed.

**TIGHT!**



Bermico fiber pipe is sufficiently flexible so it will not shatter from traffic shock nor rupture as a result of uneven settlement of the subbase. Absorbs jars and jolts without chipping or splitting.

**STRONG!**



Will not corrode, scale or tuberculate. Unaffected by sewage, acids, alkalis. Convenient 8-foot lengths and a complete line of bends and couplings for fast, economical assembly. Write Dept. EB-6 at our Boston office for information.

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LAYING 12-INCH pipe line to make a better connection to North Riverside, we used all kinds of power diggers, flanged cast iron pipe, Brown flow meters, Warner power unit, Healy-Ruff water level controls, Limitorque auto control, Smith under-pressure valve inserting machine and Arrow Hart controls.—A. R. Buller, Sup't. & Chief Engineer, Hollywood, Ill.

A WORTHINGTON 105 air compressor has been most valuable. We use this, with allied tools, for digging trenches, cutting pavement, drilling rock and painting. It has been in almost continuous service, and has proven invaluable and a great labor-saver.—Don C. Berry, Water & Sewage Superintendent, Breckenridge, Texas.

• • •

### Standard Accounting System Speeds Work

A city of 3,600, Cameron, Mo., has installed an accounting system based on the standards suggested by the National Committee on Governmental Accounting and also a new accounting system for the water and electric utilities based on the uniform system of accounts of the National Association of Railroad and Utility Commissioners. Six special funds have been abolished. The expenditure accounts were set up on the basis of character and object within activity divisions. A system of labor reports is now used to allocate labor costs to the operating funds which in turn reimburses the payroll clearing fund to permit paying an employee with a single check. An accounting billing machine is used to set up the general accounts on 11 x 11-inch ledger cards and at the end of the year these cards are bound. Large 17 x 12-inch register sheets are used to pick up by carbon the monthly entries to the ledger cards; this constitutes the expenditure and revenue journals. The expenditure ledger and journal also record the encumbrances. In dispersing cash a combined warrant and check using a snap-out carbon has been adopted. In utility billing the customer-ledger system is used with an electric billing machine which prepares the customer's ledger card, the post card, and the running record tape simultaneously. Prenumbering of revenue receipts has been adopted and all cash now passes through a Burroughs validating machine.—Public Management.

## REMODELING FARGO'S WATER PLANT

H. H. BEHLMER

Water Works Superintendent  
Fargo, North Dakota

In the Official Bulletin, N. D. Water  
& Sewage Works Conf.

AT this writing we are on the verge of realizing the completion of the filter plant remodeling job at Fargo which had its inception in wishful thinking a little over ten years ago. In 1945 a survey of the "Water Production Facilities at Fargo, North Dakota," was made by Black & Veatch, Consulting Engineers of Kansas City, Mo. Plans and specifications were drawn up in 1949 and the general contract awarded to the T. F. Powers Construction Co. of Fargo, in the spring of 1950.

Equipment for the three 4½-mgd Inflico Accelerators was purchased at about the same time directly by the Water Department. Later a contract was awarded to the T. F. Powers Construction Company for the installation of the equipment. More time will be required to complete the job than had been anticipated but the work has been progressing steadily since it began in June, 1950. For only a few days during the coldest part of the past winter was the work entirely shut down.

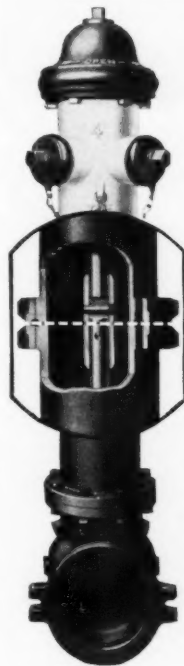
The three Inflico Accelerators, with a normal output of 4½ mgd each, are practically ready to be put into operation. They have been installed in the west half of the south, or No. 2, settling basin. Chemicals will have to be fed through a temporary arrangement until the balance of the work has been completed.

The present mixing chamber will be revamped into a pre- and post-chlorination chamber. The new location of all of the chemical dry feed machines and the chlorinators will be on a concrete floor directly above. The floor above the feeders will contain the charging room to the hoppers for the feeders below. The whole will be enclosed in a new two-story building. The Accelerators will be enclosed in a one-story building of brick, concrete and tile construction.

Under normal operation the raw water from the Red River will enter the south half of the revamped mixing chamber where chlorine will be added. If necessary aeration can

## See how one man can repair a KENNEDY SAFETOP hydrant in only 11 minutes . . .

THIS KENNEDY BULLETIN, No. 105, tells the complete story . . . how the easily-replaceable, threaded breaking ring breaks cleanly under an unusually heavy blow . . . and how one man, with only a few common tools, can put it back on the job in a very few minutes. Contains detailed illustrations.



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New EZ-ON faces slip right over old signs and they look fresh and new. EZ-ON faces save steel, time and labor! Made of 30 gauge steel, these EZ-ON faces conserve the supply of heavier weights ... and they get top priority on our stock of this steel on hand.

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crimping tool to  
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**PROVEN DURABLE!**

EZ-ON faces withstood equivalent of 3 years outdoor exposure in Weatherometer tests for color retention and bond adhesion. Also tested for reflective qualities and approved by state highway departments.

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be applied in this chamber, too. From here the water will enter the three Accelerators through a concrete flume. The flow to each will be metered and the volume controlled by 18-inch valves. The water will be diverted downward into the middle chamber where the chemicals will be added and mixed with the incoming water. The treated water rises to the surface where it enters the collecting launders which in turn conduct it to the concrete conduit leading to a rapid mix chamber followed by the primary CO<sub>2</sub> chamber. Chlorine is then again applied, and the water conducted to a flume leading to the ten filters.

**Plant Flexibility**

The completed plant will have great flexibility in that the flow of the treated water from the Accelerators can be directed to the filters by four separate routes. It can go directly to the filters from the Accelerators through the treated water flume. It can go from the Accelerators into the No. 1 settling basin, through a bypass flume to the settled water flume and to the filters. It can go directly into the No. 2 basin and thence into the treated water flume to the filters. Under normal operation both settling basins will be used with the Accelerators.

The spent slurry in each Accelerator will be collected in two sludge concentrators and drawn off automatically at predetermined intervals into a sump beneath the treated water canal. From there it will be returned to the river through a new 24-inch pipe line which will also carry the wash water from the filters. This will take a considerable load off of the sewage treatment plant which now handles all of the filter wash water with the sewage. Returning the sludge to the river is only a temporary expedient until such time as a better way of handling it is devised.

We have had a rather rough time of it during the past year trying to produce a soft stable water with the use of only our No. 1 settling basin. Then too "Old Man River" brought us the hardest water to treat that we have had in the past ten years. The sulphate hardness alone reached a high of 210 ppm during December and January of the past winter. While the remodeling job has been going on we have had an average hardness of 305 ppm in the raw water and an average hardness of 160 ppm in the fin-

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Now you can have all the advantages of uncongested non-interference operation up in the 450 megacycle range . . .

. . . for F.C.C. has given you the space, and Motorola has built for you the quality tool for best results. It is now released for sale to you after more than 2 years of rigorous testing and service in the field.

Here, once again, Motorola has put your best long-term *value* ahead of everything. It will save you up to 25% in maintenance alone.

This completely new design has the same guaranteed, obsolescence-free features that make Motorola equipment *all-ways* your best buy!

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ished water. The excessive amounts of sulphates in the raw water caused our chemical costs to run considerably higher than usual.

By drawing as much of the sludge as possible out through the valves in the floor of the settling basin we were able to keep the basin in continuous operation for three and one-half months. That gave the contractor time to proceed with the construction in the other basin to a point where we could use it while draining and washing the No. 1 basin. We have changed over only four times in the past year. Up to the time when we made a trial run to see how long we could operate on one basin, by bleeding off the sludge twice a week, it was necessary to drain and wash the No. 1 basin every four weeks throughout the year.

adhesion between aggregates and binder was not achieved. Irrespective of traffic volumes carried, the chippings became separated from the binder sooner or later; this was particularly marked in cold weather. The article investigates the causes of the failures; it is considered that, although the tars used complied with the requirements of standard specifications, increase of the proportion of pitch and medium oils used could have resulted in accelerated setting time, brought about by the evaporation of a greater part of the medium oils. The main causes of the failures, however, are said to be the use of too little binder and of too coarse an aggregate. E. Steinhilber: *Strassen- u. Tiefbau*, 1951, 5(5), 116-8. (In German.) Road Abstracts.

• • •

### New York Sanitation

(Continued from page 83)

#### German Experience with Tar Surface Dressings

Tar surface dressing operations carried out in Germany in the course of the last two years have often proved unsatisfactory, especially in South Bavaria. Sufficient

holstery, fenders, bumpers, steps, body and cab bolts.

7. Wheels and Tires check—tires, tire stud nuts, rims, axles, flange stud nuts, wheel alignment, radius rods and steering.

8. Mechanical Loading System check—all parts, piping, valves and controls.

9. Hoists System check—parts, piping, valves and controls.

10. Transmission System check—universals, drive shaft, transmission, clutch, clutch pedal clearance.

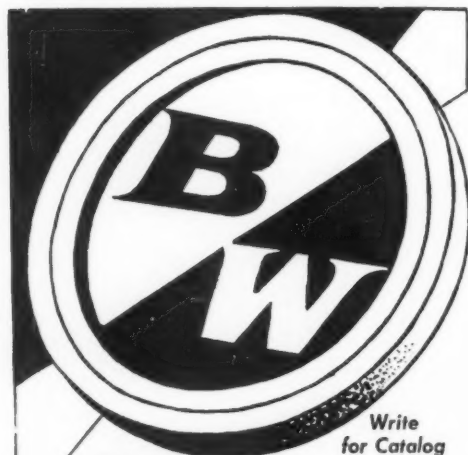
11. Engine tune-up and check—idling speed, engine knocks, cylinder head nuts, valve clearance.

12. Governor check.

#### Garage Facilities

All the necessary adjustments and replacements are made during the day and the unit returned to service. This system has enabled the Department to extend the life expectancy of equipment far beyond the theoretical limit.

Most of the Department's working equipment is housed in fifty-eight garages throughout the city. Some are City-owned and some are rented. In order to ease the burden of maintenance, a program of mechanization of garage operations has been started. High pressure lubricating devices have been installed; modern gasoline and oil dispensing equipment has been set up;



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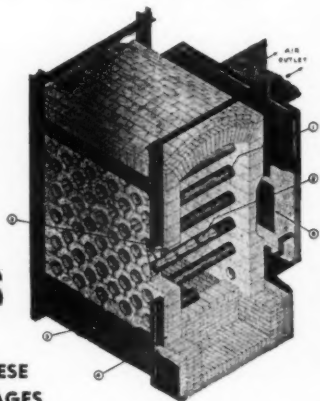
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2. Fireclay corebusters keep the air in intimate contact with the tube walls and provide additional heating surface.
3. Special recesses for caulking the tube ends and wall block joints assure minimum leakage and maximum efficiency.
4. Special "keyed" and wall blocks reduce leakage and aid in keeping the terminal walls in alignment.
5. Convenient access for ash removal from the dust pocket.
6. Manholes permit convenient replacement of individual tubes without disturbing the balance of the recuperator structure.

Bulletin No. 14 explains why.  
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provision for small machine shops, truck lifts, and truck laundries have been included in new garage designs. Utility trucks have been requisitioned which will enable garage mechanics to make many repairs on the spot on road calls saving a good deal of time which might otherwise be lost in towing disabled units back to the garage or shop. In order to establish how much of the repair work should be done at the local garage, a contract was let for the construction of a small shop in one of the Brooklyn garages. Observations will be made to determine whether or not this is more feasible than the present method of doing practically all repair work at the Central Motor Repair Shop. This problem of a central shop or multiple shops has plagued all operators of large fleets and as yet no one has come up with the "school solution".

Daily routine service is performed at each garage. This work consists mainly of filling vehicles with gas, oil and water, (and antifreeze in season), checking tires, lights, signals, mirrors, horns, brakes, windshields and springs; also washing, lubricating and making minor preventive repairs.

The magnitude of the job of maintaining this huge fleet is indicated by the amount of work performed by the Bureau during the year 1950. More than 40,000 automotive repairs of varying degrees were made. Among the major jobs were the rebuilding of 1,020 truck bodies, 364 chassis, 350 engines and 104 cabs. The electrical system repairs entailed rebuilding 2,788 batteries and 1,046 generators, motors and other electrical appurtenances. Tires take a bad beating in city traffic and 20,000 were repaired in the Bureau's Tire Shop. Every new piece of equipment adds more work to the bureau. For example, with the acquisition of mechanical street sweepers, the Broom Shop's output expanded. About 1,000 brooms were refilled during the year. In addition to the equipment mentioned above, 600 major repairs were made to street cleaning and snow removal equipment and 355 to tractors and landfill machinery.

The equipment maintained by the Bureau comprises about 3,682 as follows:

Waste Collection Trucks, 1,742  
 Heil, Gar Wood and City Tank Corp., mounted on GMC, International and Autocar chassis. There are 172 manually loaded units and 1570 mechanically loaded.

Street Cleaning Equipment, 273

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GO TO THE ROOT OF YOUR WEED PROBLEM WITH THESE DOLGE PRODUCTS



Please write for descriptive literature explaining how these tested DOLGE products can best be used for your weeding requirements.

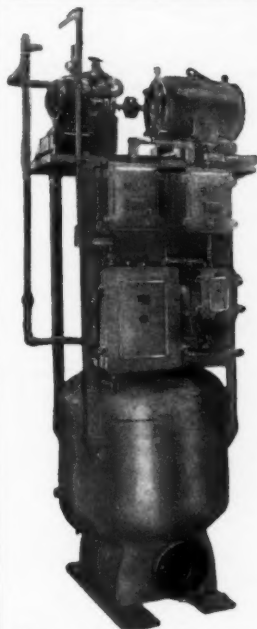
### DOLGE SS WEED-KILLER

Where no vegetation whatever is desired such as your parking places and walks. Penetrates deep down to plant roots and kills. Sterilizes the soil, preventing normal sprouting of wind-blown seeds. Weeding the thorough, modern chemical way eliminates backbreaking toil and saves the cost of many labor-hours.

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The efficient way to control weeds on your seeded areas. Works its way down into the roots of brush, dandelion, plantain, poison ivy, ragweed, sumac and other obnoxious plants, but does not injure most turf grasses.

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Get full details of this month's new products . . . mail your Readers' Service card today.

Wayne and Guttersnipe street sweepers, Autocar and Heil Flushers, American Trailer and Kleen Street leaf loaders and Ward La France wreckers.

Snow Removal Equipment, 1,010 Trojan and Galion Crosswalk Plows, Nelson and Joy Conveyor type snow loaders, Snogo and Sicard Blower type snow loaders and Good Roads salt and sand spreaders.

Landfill Equipment, 213 Caterpillar tractors and bulldozers; Browning, Northwest, Bucyrus-Erie and Lorain shovels; Heil, Gar Wood, LeTourneau and Caterpillar scrap-

ers, Allis-Chalmers road graders, Athey wagons and Lambert steam diggers.

Maintenance equipment totals 193 items, Passenger equipment 242 items, and miscellaneous equipment 9 items.

The Department is contemplating the construction of a new Central Motor Repair Shop of modern design and abandonment of the present building. The layout of the present multi-storied building does not lend itself to the most efficient operation. Various functions are segregated on different floors requiring continual

shifting of vehicles by elevators. In addition the character of the neighborhood has changed greatly in the last few years; whereas at one time this was one of the blighted slum areas of the city known as the "gas house district", it has become a residential area with the construction of the massive Stuyvesant Town project by the Metropolitan Life Insurance Company. This change has resulted in agitation for the conversion of this building to school purposes.

The proposed location near the Betts Avenue Incinerator in the Borough of Queens will permit the construction of a modern and efficiently designed building. All vehicle repair work and preventive maintenance work will be carried out on one floor at an elevation requiring only a short ramp for vehicles to reach it from the street. This floor, approximately 200 ft. by 1,000 ft., will contain areas for Preventive Maintenance Service for both trucks and passenger cars, Carpenter Shop, Tire Repair Shop, Body Repair Shop, Chassis Repair Shop, Engine Repair Shop, Forge and Welding Shop and Truck Laundry. The lunchrooms and locker rooms will be on the mezzanine above this floor.

The second floor will house the storeroom and miscellaneous other storage facilities, Machine Shop, Radiator Shop, Battery and Electrical Shop, Skid Chain Storage and Repair, Broom Shop, Sign Shop and offices. The topography of the site is ideal in that the ground slopes away to the rear. This will permit the space below the first floor to be utilized for two basement floors each reached from the street level. The lower basement floor will be used for three garages and the upper basement floor will be used for snow equipment repair and storage and for the Department Plant Maintenance Shop. Waste heat from the Betts Avenue Incinerator will be used to generate steam for heating the building. A considerable saving in operating expense will result when this project is completed.

The Department of Sanitation which serves the entire City of New York is under Commissioner Andrew W. Mulrain. The writer is the Director of Operations. Edmund A. Donnelly is the head of the Bureau of Motor Equipment. Charles Stahl is Chief of the Central Motor Repair Shop and Herbert Fritz and Kenneth Douglas are his assistants. Charles Stenson, Mechanical Engineer, is in charge of Engineering.

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Chlorine  
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- ✦ Vital control parts subjected to corrosive, moist chlorine gas.
- ✦ Chlorine hydrate impairs operation.
- ✦ Gives off objectionable, corrosive fumes.
- ✦ Difficult to change from manual to automatic operation.
- ✦ Non-linear flow meter; limited range.
- ✦ Stuffing boxes in chlorine flow system.

**BUILDERS**  
Chlorinizer

- ✦ Meters and controls chlorine gas in the dry non-corrosive state.
- ✦ No chlorine hydrate in vital control parts.
- ✦ No odorous, corrosive fumes.
- ✦ Easily adapted for change in feeding load or mode of operation.
- ✦ Positive, linear flow meter for equal ease and accuracy of reading throughout wide range.
- ✦ No stuffing boxes or packed valves in chlorine gas system.



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TO WATER MAINS**

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## Fluoridation

(Continued from page 84)

used full strength as received or it may be diluted and used at a lesser concentration. The selection of the chemical and the feeding method will be governed somewhat by existing plant facilities, the treatment rate and the amount of water to be treated as well as the continuing chemical cost. Manual control feeders are suitable where relatively constant rates of treatment are employed or where the treatment rate is changed manually. Where there is an appreciable variation in treatment rate or flow rate of the water supply, feeders providing for automatic dosage control must be installed.

There are a number of considerations which will influence the selection of the point of fluoride application. In filtration plants the chemical should be added to the water after filtration. If it is added with other chemicals during the coagulation, some of the fluoride will be lost in sedimentation and filtration. This loss will probably not amount to more than 0.10 ppm through the plant but should be avoided if possible. The fluoride chemical must be applied at a point where good mixing will be obtained and where samples for testing may be collected soon after the addition of the chemical.

If fluoride solution is to be fed from a solution tank the point of application and method of feeding should be such that siphoning of the solution from the tank into the water supply will not be possible. This precaution is necessary to guard against possible accidental overdoses of fluorides by siphoning from the solution container.

Accurate control of the process is a "must." Undertreatment of the water will not provide the dental protection to which our citizens are entitled and overtreatment might cause a discoloration of the teeth. In order to control the treatment within the range of 0.80 ppm to 1.0 ppm of fluorides, which is recommended in Tennessee, daily tests of samples from two or more points are recommended. In addition to the chemical analysis a daily check of the fluoride dosage should be made by comparing the weight of the chemical used to the amount of water treated. Accurate accounts of the chemical used must be maintained by recording loss-of-weight

feeders or by volumetric feeders mounted on scales. Where solutions are used it is desirable to mount the solution tanks on scales so that accurate weight records may be maintained. Some plants are not equipped with a master meter to measure the amount of water treated. The necessary installation of such a meter will increase the cost of the fluoridation installation but should not logically be charged against the fluoridation.

Because of the hazards involved in the handling of any toxic material, safeguards must be set up to protect the operating personnel and visitors to the plant. Where dry chemicals are used the material should be colored to distinguish it from other water works chemicals. For large installations the chemical feeders should be equipped with dust removal systems to protect the operators against inhaling excessive amounts of the chemical. Dust masks should be provided for all operators in plants using the dry chemical. Operators should wear rubber gloves when handling the chemicals and charging the feeder hoppers. The gloves should be washed before removing from the hands. Where acid solutions are used, safety goggles, rubber gloves and rubber aprons are necessary to protect the operators against accidental splash or spills.

The application of fluorides to a public water supply system does not differ greatly from the addition of other chemicals used in water treatment processes. A well trained, conscientious operator should have no difficulty in handling the process and making the necessary control tests. Carelessness and inattention to details can lead to complications and failure to obtain the benefits of the treatment. Dependable, reliable operators are first in importance, with good mechanical equipment a close second. The annual per capita cost for maintaining the treatment process is relatively insignificant.

• • •

### Revenue from Incineration for St. Louis

St. Louis, Mo., has approved plans for generation of power as a by-product of rubbish incineration. Bids will be received for construction of a combined incinerator and power generating unit which is expected to cost \$1,360,000. It is estimated that the city will receive total revenues of \$125,000 a year through the sale of power to the private electric utility.

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PUBLIC  
WORKS

## DIGESTS

**T**HIS section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.

<b>WATER WORKS</b>	<b>102</b>
<b>HIGHWAY AND AIRPORTS</b>	<b>110</b>
<b>SEWERAGE AND REFUSE</b>	<b>117</b>

## THE WATER WORKS DIGEST

**Industrial Water Supplies**

Industrial water use in 1951 was probably more than 25% of the total water used for all purposes (including irrigation) in the United States. However, the major portion is returned to the source as discharged effluent. More than 67% of the industrial plants use less than 2% of the total industrial water supply; and between 5 and 6% use approximately 80%. These major users include electrical, pulp and paper, petroleum and steel industries; and it is through these that the maximum conservation of water can be effected. It is officially calculated that the total supply available in the whole country greatly exceeds any foreseeable demands for at least 100 years. Industrial water supply becomes a problem in individual cases because of delay in planning extensions, deficiencies in distribution, absence of social organization, failure to re-use water, limited application of artificial recharge and of reclamation of waste waters, and lack of ground water control.

Abel Wolman — "Characteristics and Problems of Industrial Water Supply;" *Journal, American Water Works Ass'n*, April.

**Dehumidification Of Pipe Galleries**

Equipment for keeping dry the pipe galleries of Chicago's South District Filtration Plant has received considerable publicity since its installation in 1950. Before its use, the relative humidity in the pipe galleries was 98% and all surfaces were covered with condensate. The dehumidifier reduces this

to 25% and returns the air to the galleries again to absorb the moisture. Thus the humidity is reduced to 40-70% and there is no condensation. In being dehumidified, the air is passed through a spray of lithium chloride solution, which absorbs the moisture and then passes through a regenerator which prepares it for again absorbing moisture. A fan circulates the air from the dehumidifier through the galleries and back again. The total cost of operating the two units now in use has been \$6,900 a year; which is considered to be small when measured against the savings in repairs to filter control equipment and piping, cost of repainting, and improved working conditions in the galleries.

Fred G. Gordon and Arthur Horwitz — "Dehumidification of Pipe Galleries at South District Filtration Plant, Chicago, Ill.;" *Journal, American Water Works Ass'n*, April.

**Laying a 36-Inch Main in City Streets**

The Springfield, Ill. Water Dept. contracted the laying of a 36-inch c.i. main, most of it in city streets. Usually not more than 200 ft. of street was occupied at a time, requiring a tight, compact working force. A back-hoe was used for excavating trench. Immediately behind this was a 20-ft. boom hoist for handling pipe from curb to trench. A tractor air compressor hauled a trailer carrying two lead furnaces and a small boom derrick to handle the hot lead (65 to 77 lb. per joint) from melting pots to joints, which were caulked with air hammers. As soon as a joint had been caulked, the length of pipe was backfilled

with a bulldozer. For handling the pipe, which weighed almost 3 tons each, a special pipe-lifting tong was used, eliminating the use of blocks, ropes, slings or cables. Pipes were cut with a Wachs pipe-cutting machine in about 45 minutes per cut.

Dewey W. Johnson — "Special Equipment for Installing Large Diameter Cast Iron Water Main;" *PUBLIC WORKS*, May.

**Observation Wells For Ground-Water Study**

The County of Nassau, Long Island, N. Y., the U. S. Geological Survey, the State Water Power and Control Com'n and the Long Island Water Corp. are cooperating in the installation of observation wells whereby to conduct studies of the underground resources of Long Island, to determine the physical character of certain water-bearing strata, the fluctuations of static water levels and salinity of the water over extended periods. Several of the holes will be tested by means of electric well logging and the data correlated with geologic samples to determine the depth, limits and relative porosity of water-bearing strata. Several wells have been abandoned since 1944 because of salt-water intrusion due to over-pumping. But it is believed that the underground supply is abundant and will be adequate for many years to come if continued vigilance is exercised in the proper locating of wells and in control of pumping rates.

W. Fred Welsch — "Outpost Observation Wells;" *American City*, May.

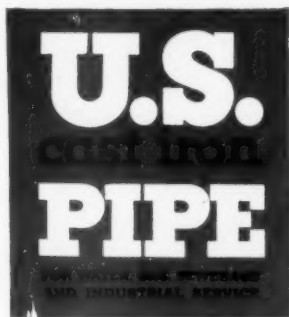


*New Orleans' famed Cabildo and Cathedral of St. Louis in the Vieux Carré as seen 100 years ago*

New Orleans has a cast iron gas main in service that was installed well over 100 years ago. Vehicular traffic in those times was a far cry from today's giant buses and trailer trucks. The engineering term—*traffic shock*—was then unheard of. There were no sewers, conduits and other underground services to cause soil disturbance. Yet this old cast iron main has had the shock-strength, beam-strength and effective resistance to corrosion to withstand the changes and unforeseen stresses of more than a century. New Orleans' experience is not exceptional. Cast iron water and gas mains, laid over a century ago, are still serving in the streets of more than 30 cities in the United States and Canada.

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### Aeration Experiments At Memphis, Tenn.

Memphis water supply consists entirely of ground water, which contains considerable hydrogen sulfide. This gas is satisfactorily removed by aeration. The water is pumped by air lift to a reservoir, where most of the hydrogen sulfide is removed and the  $\text{CO}_2$  reduced to 35 ppm. To effect further removal, the water is pumped to coke tray aerators.

To increase the supply, the city is preparing to install a new pumping station in a third well field. Here

turbine-type, deep-well pumps will deliver the water directly to aerators, which are designed to reduce 100 ppm of carbon dioxide to less than 10 ppm. Experiments were conducted to determine the best design of aerators for this purpose. These resulted in a design, now under construction, consisting of 10 coke trays with corrugated metal bottoms in which holes were punched at intervals of about 1 in. c to c in both valleys and peaks of the corrugations. The trays were set in a tower at 12 in. vertical intervals. It was found that the best

size of coke was not less than 2 nor more than 6 in. in diameter; also that it is impossible to secure consistently uniform results with an aerator dependent on natural ventilation alone. It takes slightly more than 8 seconds for the water to pass from top to bottom. The pH is increased from 5.9 to 7.1. When the 30 mgd plant is operated to capacity it will remove almost 1,000 lb. of  $\text{CO}_2$  per hr.

R. L. Brown—"Aeration Experiments at Memphis, Tenn.," *Journal, American Water Works Ass'n*, April.

### Recharging Wells to Prevent Sea-Water Intrusion

In an area of Los Angeles Co., Calif., extending 6 to 8 miles inland from the ocean, ground-water levels have dropped to as much as 50 ft. below sea level within 4 miles of the coast line, and the 250 ppm chloride line is moving inland rapidly, being 8,000 ft. or more from the shore at present. Studies during the past 20 yr. have led to several suggestions for stemming this intrusion. 1—Raise the basin water levels about sea level by decreasing the amount pumped, or, 2—by direct recharge. 3—Maintain a fresh-water ridge or salt-water intrusion barrier along the coast. 4—Develop a pumping trough along the coast line. 5—Construct artificial subsurface dikes. No. 1 has been employed but results have been too slow in taking effect. Nos. 4 and 5 are considered uneconomic. Solution 2 appears to be a possible byproduct of No. 3, and these have been studied by tests since 1950. An abandoned well field was chosen for a well-recharge test, recharge water being pumped into one of the old wells from fresh water inland wells and from the Colorado River supply. Prior to this, the water in the well stood at 17 ft. below mean sea level, and water pumped from it tested 1200 ppm of chlorides. After 5 mos.' pumping, the water level had risen to 150 ft. above sea level, and chloride samples showed the same value as the recharged water—70 to 90 ppm. The recharge water moved inland at the rate of about 8 ft. per day. The data suggested that a well-spacing of 500 ft. will create a continuous mound. A pilot program extending nearly 2 mi. along the coast is being planned, including wells spaced 500 ft. apart in a line parallel to and 2,000 ft. inland from the coast. The maximum recharge flow is expected to be 30 cfs. The State Legislature has appropriated \$750,-



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000 for the test and installation of the program will be started in 1952.

Finley B. Laverty—"Recharging Wells Expected to Stem Sea-Water Intrusion;" *Civil Engineering*, May.

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An engineer was retained in 1950 to prepare plans for a water system. His estimate seemed high; so in conference with advisors from bond houses specializing in municipal finance, it was decided to limit the distribution system, for the time being, to the main business district and the public school. Accordingly, in June, 1950, the citizens voted, 142 to 10, for a \$44,000 bond issue for the water system. Interest rates were 3% and 3.20%.

Sewer bonds, amounting to \$146,000 were voted, 139 to 7, in 1951, to construct a sewer system and treatment plant. This system was designed to serve every house in the community. Interest rates were 3.25% and 3.75%.

Financing was accomplished in the following manner: 46.67% of the profit of the municipal liquor store for the next 22 years were to be devoted to payments on the sewerage bonds; and 20% of the profits were to go to paying off the water system bonds over the next 20 years. In addition, there were special assessments totalling \$40,667, spread in annual installments over 20 years toward paying for the sewer system. Of the total water cost, \$10,151 will be raised over a 20-year period by special assessments on benefited property. Until a fund is built up to purchase meters, there will be a flat monthly charge of \$1.50 per month to all water users. Sewer rental rates will vary from 50 cents per month for homes to as much as \$40 per month for the creamery.

• • •

## Navy to Use Plastic Pipe on Small Ships

As the result of an eight-month sea test aboard a destroyer escort, the Navy plans to install plastic piping in several mine-sweepers now being built. Copper and nickel are used extensively in present shipboard piping systems where corrosion resistance to sea water is essential. In the minesweepers



where the plastic installation is planned, about two tons of copper and nickel will be saved.

The following advantages are indicated for the use of plastic piping:

Installation costs promise to be considerably less with plastics, once quantity production is begun. The cost of two-inch plastic pipe of  $\frac{1}{8}$ " thickness will be about 70 cents a foot, while similar size copper-nickel pipe costs about \$1.55 a foot and stainless steel pipe costs about \$2.25 a foot. Black steel pipe, which corrodes and therefore is not used for sea water piping, except in times of great material shortages, costs 55 cents a foot.

Maintenance costs should also be less. The tests aboard the destroyer escort have indicated that for many purposes plastics outlast metal. Even in compartments where the air was very hot the plastic pipes did not corrode or burn. Several pieces of plastic pipe were installed just above the boiler drum, where the air temperature reached 180°F. After eight months of service aboard the destroyer escort, this pipe was not affected.

Plastic pipe does not corrode from salt water and is resistant to shock. Sections of plastic pipe carrying salt water under pressure were installed just aft of the forward guns. They remained good as new and undamaged by the combination of corrosion and shock.

The chief engineer of the destroyer escort also reported that during a storm, in which the pipe was subjected to severe stress and vibration, the plastic pipe was not visibly damaged though some other pipes were.

• • •

#### The New Soil Conditioner Krilium

THE new soil conditioner Krilium has received a great deal of publicity since it was announced last December. It is a soil conditioner and not a fertilizer. No claims are made for fertilizer value of the material, but the improvement of physical conditions resulting from its use may cause the plant nutrients of soils, as well as those of fertilizers, to become more useful to growing plants.

Krilium is a pale-yellow powder that can transform tight, gummy clays into friable materials of crumblike structure. Even though it must dissolve in the soil moisture to promote physical improvement,

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Krilium does not move or leach below the zone of application; hence its effectiveness in the plow-depth may be somewhat limited by imprevise subsoil conditions.

Chemically this material is a sodium salt of a hydrolyzed polyacrylonitrile. It is a long-chain, organic molecule, somewhat similar in structure to the nylon molecule and it is nontoxic at the rates of applications used. It improves soil structure by aggregating and loosely cementing clay particles together in much the same way that decomposing organic matter acts. Yet the new compound decomposes in the soil very slowly, at a rate not yet determined.

Krilium is one of a family of chemicals developed by the Monsanto Chemical Company at Dayton, Ohio. It is not yet available commercially but is expected to be on the market some time in 1953. The Department of Agriculture and several state agricultural experiment stations have been interested in the agricultural possibilities of this material since it was first brought to their attention. During the 1951 growing season, preliminary experiments were conducted

by the USDA on saline and alkali soils in California, to find out if Krilium or closely related compounds might aid in their reclamation or in the production of more nearly normal crop yields. Favorable results were obtained, with remarkable increases in germination and stands of corn. In one case, yield increase was as much as fivefold. Other experiments at USDA field stations in Alabama, Tennessee, Pennsylvania and Wisconsin are not yet fully evaluated, but the material has been shown to produce definite improvement in the physical character of heavy clay soils. Better aeration, which is necessary for normal root development, is one of the beneficial effects.

Best results are obtained when Krilium is applied to a soil previously prepared for seeding. The dry powder should be spread uniformly, and mixed immediately and thoroughly to the desired depth. Rates of application range from 400 to 2,000 pounds per acre when incorporated in soil to a 6-inch depth. Unfortunately, the possibilities of widespread agricultural use do not seem large at present in view of proposed high introductory prices.

There are, however, a number of specialized agricultural uses for which the material should be practical—for example, preparation of potting soils, greenhouse production of flowers and vegetables, home flower and vegetable gardens located on heavy soil and possibly certain market garden areas where high-value specialty crops are grown. For garden plots Krilium should be mixed thoroughly to spade depth, using a rate of about 0.1%, or 1 lb. to 20 square feet. In the case of potting soil, 1 oz. should suffice for 100-150 lb. of soil. Another field of utilization includes the stabilization of soil in road cuts and similar engineering projects, where an application of 1 lb. per 100 square feet applied on the surface serves to hold the soil while turf is being established from seed. Additional research is planned by the Bureau of Plant Industry and by state agricultural experiment stations. One of the items receiving attention in the Bureau is the treatment of a narrow band of soil above or around the seed or a shallow overall treatment for the purpose of improving emergence. (Science, 11 April 1952, R. Q. Parks, USDA)



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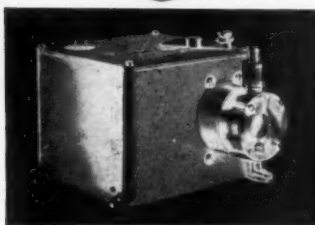
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"Hard-Facing Helps Conserve Highway Equipment in Nation's Biggest County," *Roads and Streets*, April.

**Rehabilitating  
Old Highway Bridges**

Franklin County, Ohio, finds it necessary to strengthen and widen the floors of many of its bridges constructed about 50 years ago. In doing so, it has found the most satisfactory method to be use of some of the newest steel bridge product developments which require a minimum of steel, and use bituminous surfacing. An illustration is a bridge in the city of Columbus, consisting of two 133' 8" spans with a 36 ft. roadway, with a traffic count of

about 9,000 per 24 hr. The floor was entirely reconstructed in 16 days. The old reinforced concrete floor was removed; all the steel stringers were loosened and cleaned, replaced and welded to the floor beams. A corrugated steel flooring, prefabricated in 36-ft. lengths, was welded to the stringers; and this was covered with two courses of hot-mix hot-laid asphaltic concrete. By complete welding together of floor beams, stringers and the corrugated steel flooring, the entire structure was stiffened. The steel flooring and asphalt surface gave a light-weight floor but a very strong one.

Guy H. Elbin—"Modern Rehabilitation Methods for Bridges," *PUBLIC WORKS*, May.

**Age-Strength Relations  
For Air-Entrained Concrete**

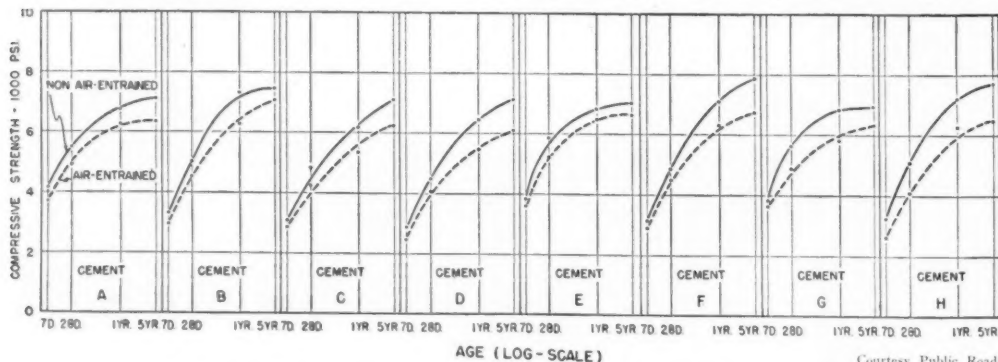
Several years' use of air-entrained concrete have shown that air-entrainment appreciably reduces the early strength; which reduction, however, is partly if not wholly offset by the improvement in uniformity of field mixtures of such concrete, and by the reduction in deterioration due to alternate freezing and thawing. To obtain definite data on the extent of loss of strength

due to air entrainment and the effect of age on such loss, the Bureau of Public Roads has for 5 years been conducting tests of concrete mixed with and without air-entrainment, using cements of four brands, type 1 and type 2 cements of each brand. The tests indicate an average reduction of approximately 10% for all ages up to 5 years; and that, using cements relatively low in tricalcium aluminate, although the strength is lower at 7 and 28 days than when cements relatively high in aluminate are used, substantially higher strength will be developed at ages of 1 year or more.

Frank H. Jackson—"Age-Strength Relations for Air-Entrained Concrete," *Public Roads*, June.

**Widening Pavement  
Without Side Forms**

The Illinois Highway Department, after three years of developing and testing the method, expects this year to widen 950 miles of old concrete pavement without using side forms. The method is a joint undertaking developed by engineers, equipment manufacturers and contractors. By the old method, construction of 5,000 ft. of 2-ft. widening along one side of a pavement was a good av-



AGE (LOG-SCALE)

Courtesy Public Roads

● EFFECT of air entrainment on the compressive strength of concrete.

erage for a 10-hr. day. With the forms eliminated, 9,000 ft. is not unusual. It is estimated that the new method costs \$1,000 to \$1,500 per mile less than the old. The key to the method is a concrete widening machine, which receives the concrete from a mixer or transit-mix truck into a steel box about 4 ft. long and the width of the new strip. This serves as a temporary form for the new concrete. A wing plate on the outside of the box pulls fresh dirt against the edge of the concrete, where it is compacted by a pneumatic tire. The concrete is vibrated, and a heavy steel plate slides over the top of it. A membranous curing compound is applied for curing.

"Illinois Will Save a Million Dollars This Year by Widening Pavement Without Side Forms," *Engineering News-Record*, April 17.

### Controlling Temperature Of Hot Asphalt Mixes

The greatest cause of failure in bituminous pavements that did not show distress immediately after construction is the hardening of the asphalt, which usually occurs in the mixing operation, resulting from oxidation of the asphalt and loss of its lighter fractions—both very sensitive to the temperature of the mix. The only logical method of controlling the mixing temperature and at the same time make the control universally applicable to asphalts of all consistencies and from all sources is to specify that the mixing temperature be such that the viscosity of the specific asphalt being used must be held within certain specified limits during the mixing period. It is recommended that the mixing temperatures correspond to a Saybolt Furol viscosity of 150 seconds for the asphalt actually used, and under no circumstances higher than that corresponding to a viscosity of 75 seconds.

H. G. Nevitt—"Temperature Control of Hot Mixes," *Roads and Streets*, April.

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Precast Prestressed Concrete Span, By Jacob O. Whitlock, Co. H'way Supt., Montgomery Co., Ill. April, Pp. 31-32.  
Wyoming Modernizes Radio Plant, By Thurman D. Sherard, Head of Commun. Div. April, Pp. 33-34, 44.  
Special Rigging Moves Side-Slipped Slabs, April, Pp. 35-36.

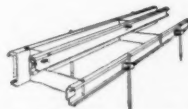


SAVING  
COST AND  
TIME ON A HOSPITAL  
CONSTRUCTION JOB

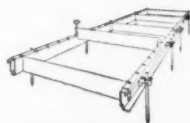
**PROBLEM:** To set a curb fast enough to be completed for a paving job scheduled on the following day. Available labor lacked special skills and experience.

**ANSWER:** Standard Heltzel dowel joint curb forms were used on the job with economy of time and money. Common labor on the job easily managed setting of the forms because Heltzel forms are designed with exclusive, practical aligning and staking devices.

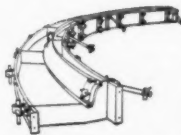
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### Contractors Record (England)

An Analysis of Tractors. By Noel D. Green.  
April 9, Pp. 30-39.

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Illinois Will Save a Million Dollars This Year  
by Widening Pavement Without Side Forms.  
April 17, Pp. 59-61.

### Public Roads

The Effect of Barrier-Line Location at No-  
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Age-Strength Relations for Air-Entrained Con-  
crete. By Frank H. Jackson, Physical Re-  
search Engr., B.P.R. May, Pp. 31-36.

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Modern Rehabilitation Methods for Bridges.  
By Guy H. Elbin, Co. Engr., Franklin Co.,  
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mader Davis, Jr., Equip. Engr., Virginia  
Dept. of H'ways, May, Pp. 53, 106.  
Motor Graders, Bulldozers and Loaders Help  
Maintenance Team. By R. H. Davis, Chf.  
Equip. Engr., N. Car. H'way Com'n. May,  
Pp. 67, 81.  
Special Blade on Grader Facilitates Widening  
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Sufficiency Ratings in Relation to Tolerable  
Standards and Priorities. By C. E. Fritts,  
U. P. of Automotive Safety Foundation.  
April, Pp. 54-57.  
Conclusions from Compaction Studies on Clayey  
Sands. April, Pp. 59.  
New Emulsion Plant Typifies Growth of As-  
phalt Paving Field. April, Pp. 95.  
Temperature Control of Hot Mixes. By H. G.  
Nevitt, Socony-Vacuum Oil Co. April, Pp.  
96-101.

### Small City Saves on Insurance Premiums

Stoughton, Mass., (11,146), has  
improved its fire defenses and ob-  
tained a fire insurance classification  
from the underwriters rating bureau

### PUBLIC WORKS for June, 1952

which has resulted in a saving of  
10 per cent in fire insurance premi-  
ums paid by property owners. Dwellings have been put in Class B  
and mercantile properties in Class  
4. Town Manager Donald H. Blatt  
estimates that the cost of improve-  
ments made by the town will be  
offset by the savings in premiums  
over the next four years. Improve-  
ments included placing gate valves  
on fire hydrants, adopting a building  
code and appointing a building in-  
spector, building a second water  
pumping station, erecting a drill  
tower for firemen, purchasing a new  
piece of fire apparatus, and making  
certain changes in the management  
of the fire department—Public  
Management.

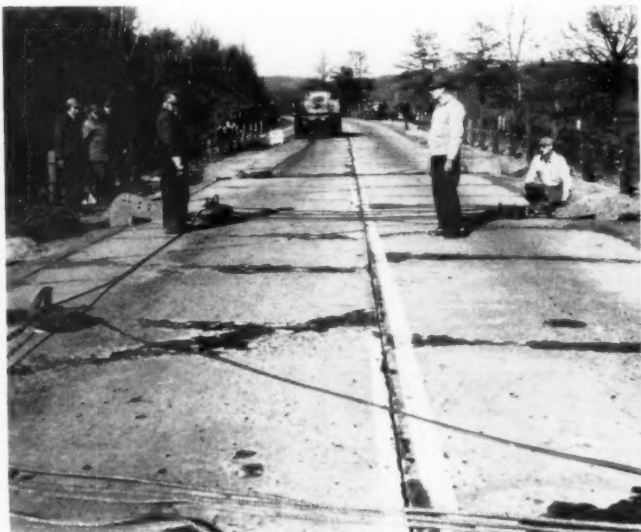
### Highway Slab Slip

(Continued from page 71)

is equal, the trucks commence pull-  
ing together. It is necessary for  
them to move a very short distance  
to bring the slab back into place.  
The slabs on the job shown here-  
with were 60 ft. long, 11 ft. wide  
and 8 ins. thick, and weighed about  
60 tons.

The first successful use of this  
slab-moving equipment was in No-  
vember, 1951, on sections of Route  
9 in the Town of Haddam. Longest  
delay to traffic in this operation was  
5 minutes.

Some experimental work has been



● AFTER the moving operation—slab back in proper place.

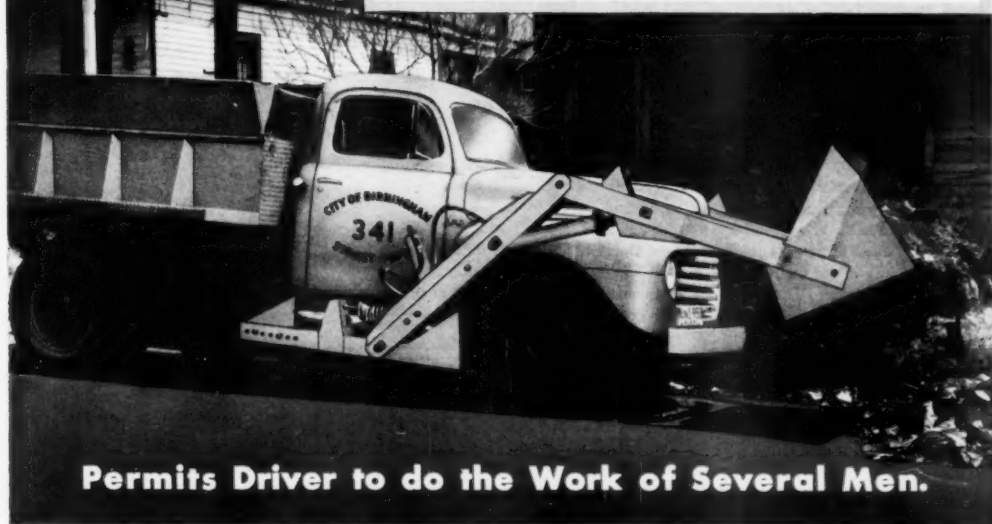
## New HOLMES OWEN LOADER

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The versatile, one-man operation of this equipment permits the truck driver to do his own light digging, grading, loading and cleaning-up without additional manpower or the use of more costly equipment. The loader is hydraulically operated, lifts  $\frac{1}{2}$  yard per bucket; loads average truck in 4 minutes and can be installed on most  $1\frac{1}{2}$  to  $2\frac{1}{2}$  ton trucks. See your equipment dealer or write factory for details.

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undertaken to install ties to keep separation from occurring, either in slabs that have been moved, or where conditions are such that separation may occur. The department has constructed experimental brackets which are installed at opposite points on the outside edge of the pavement. A hole is drilled in the side of the pavement slab and bolts set in lead wool are used to fasten the brackets in place. These brackets are set 10 ft. apart. Common fence cable is run under the pavement, pulled taut and spliced to an I-bolt. A nut is used to tighten the

cable and hold it fast. Ties of this sort were installed on the Haddam job and are expected to prevent further lateral slippage of the slabs.

The Haddam job was done at a time when there was frost in the ground, but this did not interfere with the work.

#### How Rome Solved its Garbage Disposal Problem

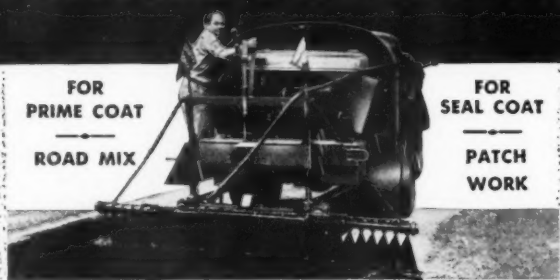
A landfill, located only two blocks from the city's main street, has solved the garbage disposal problem for Rome, Ga. Only garbage is han-

dled at the fill; leaves, brush and rubbish are trucked well away from the city and burned. About 20 tons of garbage and 2 tons of waste from the State Hospital are disposed of daily at the fill. Daily garbage collections are made by 6 trucks, with an additional 8 working only on Saturdays. Residential areas have collections on alternate days; the business area has daily collections. An International TD-14A tractor with a Drott bulldozer are used at the fill. W. C. Adams is Superintendent of Sanitation.

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#### Radioactivity

(Continued from page 78)

equipment is needed for evaluation of alpha radiation.

A simple count of disintegrating atoms or a known proportion thereof will give a measure of total radioactivity. If only one isotope is present, or a very simple mixture, identification may be accomplished by energy and decay time measurements.

In the presence of a number of radioisotopes, such as mixed fission products, identification is more difficult. Chemical separation of the various elements, known or suspected, will then be required. Such procedures are tedious and time-consuming and require techniques unfamiliar to those normally engaged in stream survey work.

At the levels to be expected, complete analysis may be impossible. Some compromise, such as identification of the main constituents, possibly 70% to 80% of the total, would have to be accepted. For a reasonably accurate radiochemical analysis of mixed fission products the activity level of the samples should be at least 500 counts per minute per milliliter or capable of being concentrated to this level for analysis.

In addition to assay and analysis, solid specimens can be examined by autoradiography. In this technique specially produced films are exposed to the specimen for a period of time, possibly days. Many things can be learned from autograms but their production and interpretation is a highly specialized field.

#### Appraisal of Results

No stream study program is worthwhile unless one compiles, analyzes and reports the results with recommendations for improve-

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ment. In general in a complex environmental health program, certain fundamental elements will always have to be considered. Briefly stated, they are:

1. Recognition of danger to health.
2. Determination of where, how, and to what extent the harmful agent may occur.
3. Establishment and adoption of maximum permissible limits of exposure.
4. Recommendations for methods to control the hazard at its source or to eliminate or minimize its effects in the environment.
5. Measurement and appraisal of the effectiveness of control measures after they have been established, and re-examination of evidences of injury to be sure the expected benefits are realized and are dependable.

For radioactive contaminants, as in the case of other contaminants, the results must be interpreted in terms of human and other hazards. At the present writing there are no universally accepted maximum permissible concentrations of radioisotopes in water. Two subcommittees of the National Committee on Radiation Protection are endeavoring to establish these values. They are the subcommittees on "Permissible Dose from External Sources" and "Permissible Internal Dose." The values under consideration by the Subcommittee on Permissible Internal Dose are given in Table 2.

For mixed fission products, the value  $10^{-7}$   $\mu\text{c/cc}$  of water may be used. Where the radiation is known to be from a specific isotope, the value for that isotope should be used. This may vary, by several orders of magnitude from the general value. The values in use for external radiation are given in "Safe Handling of Radioactive Isotopes", Handbook Number 42, National Bureau of Standards, U. S. Department of Commerce and this is recommended reading for its brief discussion of the elements that determine radiotoxicity and the classification of radioisotopes according to relative radiotoxicity.

In addition to the discussion contained in Handbook 42 some other facts should be considered.

1. Alpha radiation will seldom constitute an external radiation hazard.
2. Effects of radioactive materials retained in the bottom sediment will be of a different order of magnitude and represent a different kind of hazard from similar activity contained in the

liquid phase. Such materials are segregated and shielded and will not readily become an internal hazard.

3. Radiation exposure is cumulative. While water alone may not be above maximum permissible values, a summation of radiation from all sources may be above such values. At the concentrations to be expected in ordinary stream contamination, total exposure over a long period of time is probably more significant than momentary exposure.
4. All biological organisms do not react in the same way and there is a possibility of radiosensitive individuals.
5. Where isotopic dilution (dilution with a stable isotope in the same chemical form) is a factor, the uptake of radioactive materials will be limited.
6. The concentration in water will have to be interpreted in the light of potential biological or physical reconcentration.

7. Where standards for human exposure are met, all other uses will probably be taken care of, with the possible exception of contaminated materials that would increase background in experimental equipment.

The regulation of the disposal of radioactive wastes has been a responsibility of the Atomic Energy Commission either in its own installations or through licensing of non-commission users of isotopes. A document published by the Commission, "Handling Radioactive Wastes in the Atomic Energy Program", is recommended reading. Few industries have been as conscientious in attempting to solve an industrial waste problem. Ultimately, it may be presumed that appraisal of injury and regulation will be entrusted to public health authorities.

Work described in this article was performed under contract No. W-7405-Eng-26 for the Atomic Energy Commission.

TABLE II — MAXIMUM PERMISSIBLE CONCENTRATION UNDER CONSIDERATION FOR RADIOISOTOPES IN WATER

Element	Half-Life*	Microcuries per cc ( $\mu\text{c/cc}$ ) In Water
U Nat. (Sol.)	$4.50 \times 10^9$ years	$8 \times 10^{-5}$
U <sup>233</sup> (Sol.)	$1.62 \times 10^5$ years	$1.5 \times 10^{-4}$
Ra <sup>226</sup>	1620 years	$4 \times 10^{-8}$
Rn <sup>222</sup>	3.83 days	$2 \times 10^{-6}$
Pu <sup>239</sup> (Sol.)	$2.41 \times 10^4$ years	$1.5 \times 10^{-6}$
Po <sup>210</sup> (Sol.)	138.3 days	$3 \times 10^{-5}$
C <sup>14</sup> (CO <sub>2</sub> )	5,720 years	$3 \times 10^{-3}$
H <sup>3</sup>	12.5 years	0.2
Ca <sup>45</sup>	152 days	$5 \times 10^{-4}$
P <sup>32</sup>	14.3 days	$2 \times 10^{-4}$
K <sup>42</sup>	12.44 hours	$1 \times 10^{-2}$
S <sup>35</sup>	87.1 days	$5 \times 10^{-3}$
Na <sup>24</sup>	14.9 hours	$8 \times 10^{-3}$
Cl <sup>36</sup>	$4.4 \times 10^5$ years	$2 \times 10^{-3}$
Fe <sup>55</sup>	2.91 years	$4 \times 10^{-3}$
Fe <sup>59</sup>	46.3 days	$1 \times 10^{-1}$
Mn <sup>56</sup>	2.59 hours	0.2
Cu <sup>64</sup>	12.88 hours	$8 \times 10^{-2}$
I <sup>131</sup>	8.0 days	$3 \times 10^{-5}$
Sr <sup>90</sup>	53 days	$7 \times 10^{-5}$
Sr <sup>90</sup> + Y <sup>90</sup>	25 years	$8 \times 10^{-7}$
A <sup>11</sup>	1.78 hours	$5 \times 10^{-4}$
Xe <sup>133</sup>	5.271 days	$4 \times 10^{-3}$
Xe <sup>135</sup>	15.3 minutes	$1 \times 10^{-3}$
Co <sup>60</sup>	5.2 years	$2 \times 10^{-2}$
Au <sup>198</sup>	2.69 days	$3 \times 10^{-3}$
Au <sup>199</sup>	3.3 days	$7 \times 10^{-3}$
Cr <sup>51</sup>	26.5 days	0.5
Ni <sup>59</sup>	$(2-3) \times 10^5$ years	0.25
Mn <sup>50</sup>	68.3 hours	14

\*Half-life values have been added.



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## DIGESTS

## THE SEWERAGE AND REFUSE DIGEST

**Fires in  
Refuse Dumps**

Fires may be caused in refuse dumps either by spontaneous combustion or by hot ashes or burning materials on or near the dump. Since a large part of domestic refuse is combustible, a fire once started is sure to spread. Some types of combustible material, such as coal and drying oils, possess the property of so interacting chemically with the oxygen of the atmosphere as to produce heat. This heat is cumulative unless it is dissipated as fast as it forms. Since the chemical action requires oxygen, if no additional air is admitted from outside, that originally in the dump may be exhausted before combustion temperature is reached. Hence to prevent spontaneous combustion, the material should be thoroughly compacted to reduce the air spaces, should be placed in thin layers to provide maximum surface per unit volume to permit rapid radiation of heat, and should be covered by compacted earth or other material to prevent access of air from the outside. If this is done, fires are not likely to occur, but occasionally do. Should steam or other evidence of fire be detected, the fire may be prevented from spreading by covering the top with a layer of compacted fine soil, or by digging trenches and filling them with water. Recently fires have been controlled by placing pieces of solid carbon dioxide in cracks that have developed and then sealing the cracks with fine inert material.

G. Moore—"Spontaneous Combustion in Controlled Tips," *The Surveyor*, May 3.

**Ultrasonic Vibrations  
As a Bactericidal Agent**

The possibility of utilizing high intensity, high-frequency sound waves in treating water or sewage has an appeal to the interest of sanitary engineers; can they be used

to coagulate suspended matter more rapidly or as a bactericidal agent? The authors, considering only the latter, say that it may be possible with water but is impracticable, since the operating costs would be \$15,000 per mg if the temperature of the water were raised to 140° F. With sewage or industrial wastes the process would be ineffective if the turbidity exceeds 500 ppm. and at lower turbidities the cost would be greater than with water.

John P. Horton, Murray P. Horwood and Donald E. Phinney—"Applicability of the Lethal Properties of Ultrasound to Sanitary Engineering Practices," *Sewage and Industrial Wastes*, April.

**Operating  
Activated Sludge Plants**

The operator of an activated sludge plant, in order to secure maximum efficiency, can control (1) Concentration of solids in the mixed liquor; (2) rate of air supply; (3) rate of sludge return; (4) aeration time; (5) dissolved oxygen in the mixed liquor; and (6) condition of sludge. High concentration will speed up the absorption process. It is generally desirable to keep the solids on the high side, to prevent upset by sudden heavy loads of strong sewage; however, an excess may cause rising floc in the final clarifier. A Mohlman index between 100 and 200 is generally satisfactory. The rate of sludge return averages about 25% of the through-put rate in most plants, though this varies with the strength of the sewage and density of the sludge. The amount of air supplied varies from ½ to 2 cu. ft. per gallon of sewage; enough to maintain not less than 1 ppm of dissolved oxygen at the end of the aeration basin. The pH of the mixed liquor should be between 7 and 8.

Bulking is of two types—one in which the sludge is well flocculated but the sludge index is 300 or more and the floc settles slowly, but the

supernatant is quite clear; in the other type, there is no definite line of separation between the solids and the liquid. The authors discuss the causes and remedies of each of these. In general, they say, bulking is due to an improper balance between the absorption and oxidation phases of the process. "Sludge rising" is not true bulking; it may be due to septicity, or to extremely high nitrate content in the aerator effluent. Other problems discussed are clogging of air diffusers, foaming, and addition of digester supernatant to the aeration basins.

A. A. Kalinske and H. W. Gillard—"Operating Activated Sludge Plants," *Public Works*, May.

**Concentration of  
Raw Sludge by Flotation**

Laboratory research and pilot plant operation by the Allegheny County Sanitary Authority have demonstrated that the concentration of raw sludge by flotation through biological means aided only by temperature and time controls is practical and can yield average daily solids concentrations of 20%, and the sludge produced can be dewatered successfully on a vacuum filter without the aid of conditioning chemicals. The optimum temperature was found to be 35°C and optimum time 120 hours. Best results are obtained by preheating the raw sludge to the desired temperature. The supernatant from the concentration tanks, when returned to the influent raw sewage, did not cause any treatment difficulties nor increase the BOD of the sewage more than 7% or the suspended solids more than 10%.

Activated sludge by itself did not concentrate by biological flotation. Some mixtures with raw sludge concentrated by flotation, but in time the activated sludge settled to the bottom. There seems to be a solids limit to which raw sludge may be concentrated. The degree of concentration is influenced by the

solids content of the raw sludge, volatile content, pH and other factors. Inert matter, except unusually high concentrations of silt and grit, has no observable effect on the flotation process. Concentrated sludge can be digested successfully.

J. F. Laboon — "Experimental Studies on the Concentration of Raw Sludge;" *Sewage and Industrial Wastes*, April.

### Eliminating Steel In Plant Construction

The necessity of cutting the use of steel to a minimum is as great in England as in the U. S., if not greater. An English sanitary engineer's suggestions for meeting this necessity may offer some suggestions for engineers in this country. As for reinforcement in concrete, practically all concrete work in sewage treatment plants can be built without reinforcement as cheaply as with it. Exceptions are horizontal slabs of floors and roofs. Metal screens may often be omitted, sometimes by substituting comminutors. Instead of bar screens, slots 1½ to 2 in. wide spaced 18 in. apart in a concrete wall are often even more satisfactory, seldom

clogging. For pipes about the plant, concrete or other materials can be used instead of steel or cast iron. For sedimentation tanks, old-type hopper bottoms can be used, eliminating the use of sludge collectors. Instead of steel arms for distributors on percolating filters, copper pipe could be used ("If they can't get bread, let them eat cake").

L. B. Escritt — "Constructing Sewage Works Without Steel;" *The Surveyor*, April 12.

### Instructions for Planning Septic Tanks

The U. S. P. H. S. Environmental Health Center has been studying the subject of disposal of household sewage by septic tanks, and has recently published its latest findings, among which are the following: Two compartments are slightly more efficient than one; more than two is not economically justifiable. Tanks made of large sewer pipe perform satisfactorily and may be cheaper than rectangular ones. Probably most trouble with septic tanks is because of ineffective soil absorption of their effluents. To determine the percolating area required, bore several 4 in. auger holes in the ground in

the area proposed, as deep as the drainage trenches; saturate the soil; then put in each hole 6 in. depth of clean water and note the time it takes to fall 1 in. The inches per hour of effluent applied should not exceed 2% of the inches per hour absorption rate in the test holes. Absorption rate may decrease 20% in 16 months; more rapidly if ground garbage is discharged into the tank. Biological action tends to reduce clogging. Ordinarily tanks must be cleaned about every four years.

"Satisfactory Septic Tanks Possible if Existing Know-How is Followed;" *Engineering News-Record*, April 17.

### Effects of Detergents on Operation of Treatment Plants

Synthetic detergents have been suspected of reducing the settleability of raw sewage, but soaps seem to have greater dispersive action. No major problems in digestion should result from use of detergents. They reduce the amount of grease removed in primary sedimentation, thus passing more on to the secondary processes. This may cause deposits on filter media. Secondary processes using aeration are espe-

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cially affected adversely, foaming on top of the aeration units often being so great as to interfere with operation, and the light foam is blown for long distances, depositing grease which is not readily removable. Foam formation seems to be increased by length of aeration time and concentration of detergent. Presence of suspended solids reduces foam formation, and addition of supernatant seems to increase it. Defoaming agents, such as Dow-Corning Anti-foam A, are available which, when sprayed on a foaming surface, quickly disperses the foam.

R. N. Simpson—"Bubble-Trouble With Detergents;" *Waste Engineering*, April.

#### Treating Wastes from a Large Chemical Plant

The Willow Island plant of the Calco Chemical Div., American Cyanamid Co., on the Ohio river makes widely diversified chemical products. The wastes from the various processes total 2.5 mgd. Additional facilities for producing aureomycin are to be added, the wastes from which will include strong fermentation beers with BOD ranging from 4,000 to 7,000 ppm; floor and equipment washings with 600 to 1500 ppm BOD; inorganic solids, including vacuum filter-precoat; and acids and alkalis, butanol and brine. The plant for treating these wastes will include pH control, a holding and aeration unit, sedimentation, trickling filters with recirculation, secondary sedimentation, chlorination, return of secondary sludge ahead of aeration or primary sedimentation, dewatering of the combined sludge by vacuum filtration and disposal of it by land fill or burial. The filters will be walled in so that they can be flooded for fly control and to prevent flooding by high water in the river.

John F. Vogler, J. N. Brown and Guy E. Griffin—"Chemical and Antibiotic Wastes Treatment at Willow Island, West Virginia;" *Waste and Industrial Wastes*, April.

#### Calcium Chloride for Treating Industrial Wastes

A few years ago the Lawrence Experiment Station developed a method for using calcium chloride and carbon dioxide in treating wool scouring wastes. Three New England plants are now treating all their wastes with calcium chloride (but are not using carbon dioxide), and several others have experi-



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mented with it, including two on wool-scouring wastes, one on rouge wastes and one on wastes from a fulling mill. The results obtained seem to be satisfactory. It is equally effective with soaps, syndets and mixtures. The amount of calcium chloride required in actual practice is generally less than was predicted in experimental tests, which is probably why carbon dioxide is not used; it is probable that its use would reduce chemical cost.

Joseph A. McCarthy—"Use of Calcium Chloride in the Treatment of Industrial Wastes;" *Sewage and Industrial Wastes*, April.

### Wastes Deficient in Nutritional Requirements

Some industrial wastes do not contain sufficient nitrogen and phosphorus to support biological stabilization, but the deficiency can be made good by admixture with sufficient domestic sewage. Experiments with cotton kivering wastes, rope pulping wastes and brewery wastes were conducted to determine what can be done where sufficient domestic sewage is not available. It was concluded that they could be treated successfully with as little as

5% sanitary sewage and with BOD loads as high as 70 lb. per 1,000 cu. ft. aeration capacity per day, if nitrogen and phosphorus requirements are supplied by supplementation. Critical nitrogen requirements on the basis of BOD removal are estimated to be 3, 4 and 3 lb. per 100 lb. of 5-day BOD removed at 10°, 20° and 30° C, respectively; and phosphorus requirements, 0.6, 0.7 and 0.5 lb. A critical nitrogen deficiency tends to decrease the rate of BOD removal, impair the settling and dewatering characteristics of the sludge, and decrease the rate of sludge growth. Less than 7% nitrogen content of dried activated sludge, based on volatile matter, is a good index of nitrogen deficiency.

E. N. Helmers, J. D. Frame, A. E. Greenberg and C. N. Sawyer—"Nutritional Requirements in the Biological Stabilization of Industrial Wastes;" *Sewage and Industrial Wastes*, April.

### High-Oxygen Atmosphere Treatment

In operation of activated sludge plants, within certain limits, the greater the amount of aeration per unit volume of sewage treated, other

things being equal, the better the quality of the effluent and of the sludge produced. This suggests the idea of aerating with a synthetic atmosphere containing a high proportion of oxygen. The idea was studied at the Sanitary Engineering Laboratory of the University of Illinois by means of specially designed apparatus. It was concluded that the procedure is impracticable. Also the cost would be at least four times as great as that of the conventional process.

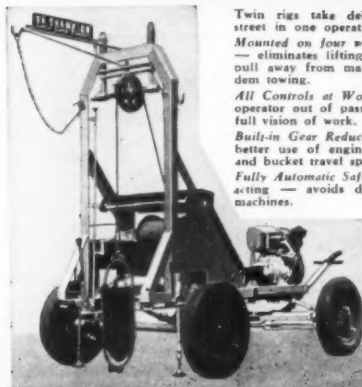
Harold E. Babbitt—"Aeration with a High-Oxygen Atmosphere in A. S. Process;" *Wastes Engineering*, May.

### Refuse Disposal Methods Compared

If refuse has decayable garbage in it, the open dump should not be tolerated. Nor should hog feeding, unless the garbage be sterilized before feeding. Sanitary land fill is acceptable if there is an adequate fill area conveniently located. Composting has been a failure in the United States; the Becari process has been tried and abandoned; and Miami, Fla., planned to cooperate with business interests to use the Verdier

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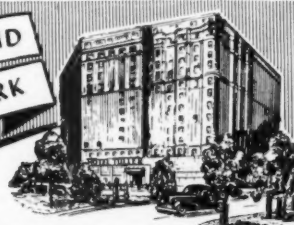
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process, but the plan collapsed. Incineration insures total elimination of health hazards, producing a residue that is inert, sanitary, and can be used for fill anywhere. The suggestion that incinerator capacity be increased by incomplete burning the author considers to be unsound from every point of view.

William S. Foster—"Let's Think Straight About Refuse Disposal," American City, May.

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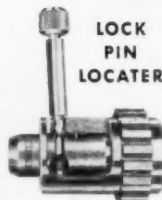
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We are using mechanical catch basin cleaners on routine maintenance thereby eliminating another costly maintenance operation. Some

of these catch basin cleaners have an interchangeable clam shell bucket and are equipped with outriggers. With these attachments they can be used for minor trench excavations and for cleaning drainage outlets. This Department does not have the problem of maintenance of roadside ditches as we eliminated this type of cross section on most of our highways.

In regard to betterment projects we have recently adopted a policy of handling this work by contract rather than force account. By this method we are able to utilize the contractor's specialized equipment rather than attempting to purchase such equipment out of limited appropriations which are needed for replacement of obsolete machinery and normal trading of motor vehicles.

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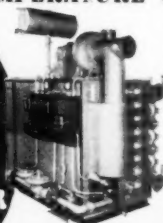
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following recommendations for plastic white line road marking materials: The aggregate should be light colored and of suitable grading, the limits of which are given. Small glass spheres may be used as part of the aggregate. The most suitable pigment in current use is titanium dioxide (anatase type); basic pigments such as zinc oxide should not be used. The mix should contain not less than 5 per cent by weight of titanium dioxide. Suitable extenders are barium sulphate, calcium carbonate or silica, ground to pass a 200-mesh sieve. The total content of pigment and extender should be between 18 and 22 per cent by weight of the total mix. The binder should consist of gum rosin fluxed with mineral oil and should constitute between 18 and 22 percent by weight of the mix. Methods of analysis are outlined. Recommendations are made on the heating and laying of the plastic and on the preparation of the road surface.

### Sewer Cleaning in Hayward

**HARRY H. SHATTO,**  
Director of Public Works,  
Hayward, Calif.

Our most interesting job this past year was the cleaning of the 33-inch vitrified outfall sewer. We used about 800 ft. of  $\frac{3}{8}$ -inch cable, one A-frame, braces, pulleys and an American Hoist with  $1\frac{1}{2}$ -yd. bucket. Our access cleanouts are about 400 ft. apart and are 5-ft. by 5-ft. square concrete boxes. We set up the A-frame and floated a line through the sewer; then we tied our cable on and pulled it through. We set pulleys on trench jacks in the clean-out boxes, threaded the cable over the pulleys, clamped the bucket on the cable at each end. The bucket came up about three-quarters full on each trip.

### Composting Garbage

(Continued from page 75)

garbage reaches the plant are performed mechanically—grinding, conveying, removal from the composter and bagging. There is no chance for vermin to reach the waste. The grinding house is designed to be rat-proof; the conveyor system is enclosed; and the outer composter is screened to exclude flies and rodents. With ordinarily careful operation the plant can be kept free of vermin

and will produce no odor. The neat and attractive appearance of a composting installation is a further aid in preventing objection.

Composter units range in size from 25 tons upward. For a typical city of 10,000 population, the plant would consist of three 25-ton composters and the supporting units, such as the grinders, conveyors, unloaders and baggers. A city of 25,000 population would probably require four 75-ton composting units and supporting equipment. Four men would be required to operate a plant serving 10,000 population

and six men for a plant for 25,000 population. Initial cost is moderate—less than for some other accepted methods. Needed expansion can be provided, as required in the future, by adding a new composter and the required length of conveyor.

A 25-ton composter is 12 ft. in diameter and 18 ft. high, and is built on a concrete slab 15 ft. square.

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## PUBLIC WORKS for June, 1952

of compost and 10,000 gals. of liquid per month. It will cost about \$7 per ton to produce compost by this method—only a fraction of what compost of a like nature sells for; and the liquid fertilizer has an estimated value of \$1 per gallon.

### 1902 Estimates

(Continued from page 70)

is 140% of the average and the maximum hour is 245% of the average.

### St. Louis Data

Information of a somewhat similar nature has been furnished us by Thomas J. Skinker, Water Commissioner of St. Louis, Mo. The curves shown herewith were originally prepared by the office of Edward Flad, Water Commissioner, in 1901. Curves showing the actual population growth and the estimates by Mr. Hazen have been added in this office. The forecasts appear quite optimistic in the light of present-day figures. Mr. Hazen's estimate was made in late 1901 and accompanied a report of Jan., 1902.

The 1950 population was estimated by Mr. Flad's office at 1,740,000 and by Mr. Hazen at 1,445,000. The actual 1950 population was 852,623.

The water consumption estimates made in 1901 are, of course, based on daily per capita use. Mr. Hazen's estimate was set up for rates varying from 50 to 200 gpcd. Actual use in 1950 was about 175 gpcd and the total daily average consumption of 157.4 mg was not far from the midpoint of Mr. Hazen's figures.

### Miami Water Supply

(Continued from page 67)

will be chlorinated as it leaves the filters and enters the pure water reservoir. Provision is also made for prechlorination to prevent algae growths in the softening units.

The chemical house, pumping station, laboratory and offices of the treatment plant are combined in one building, with the washwater tank on the roof. Chemical equipment will include dry-feed machines for dosing the lime and alum, and a bin is provided for a future machine to feed soda. Tanks and measuring pumps are installed for feeding the activated sodium silicate. It is planned to activate the sodium silicate with carbon dioxide gas.

Dry chemicals will be unloaded from cars on the siding by a vacuum

air system, which will deliver it directly to storage bins. The chlorine room will be equipped with automatic chlorinators with provision for feeding chlorine at desired points. Carbon dioxide will be taken from the diesel engine exhaust, washed and pumped to the recarbonation basin and the silica activator.

All controls for the treatment plant will be centralized in a control room where gauges will indicate the rates of flow at various points, the levels of the various tanks and other data necessary for proper operation of the plant. Controls are also provided in the control room to start and stop pumping from the permanent wells.

The plant is designed to be safe against a flood level of elevation 12, about 3 ft. above the highest known level in the Miami area.

With the completion of the current project, Miami will have spent upward of \$30,000,000 since the city took over the water system 10 years ago, including the purchase price of \$5,179,945. Prior to that time the city owned the supply system and the Florida Power & Light Co. handled the distribution. William A. Glass, who had been with the Florida Power & Light Co., went with the Department of Water and Sewers and has served as Director of the department ever since. In the technical operation he is assisted by William W. Aultman, as Assistant Director; George A. Weigand as Chief Engineer; William L. Black as Superintendent of Treatment Plants; and Harold R. Wright as Superintendent of Distribution. The department is governed by an independent Board, established by legislative act amending the Miami charter. This Board reports to the Miami City Commission on budget and rate-making matters. Day & Zimmerman, Inc., have been the consulting engineers for the department since the city took over complete control and have been represented at Miami by C. F. Wertz as Resident Engineer. Last year water rates were increased 14 per cent to provide sufficient income to support water revenue bonds for the present improvements. The Department issued \$8,000,000 in bonds when the project was taken over 10 years ago and subsequently issued \$11,000,000 in bonds. Most of this money has been expended on continuing improvements. While the contemplated expansion will take care of the city's normal growth for a few years to

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come, further expansion of treatment facilities will be required in the foreseeable future.

Some help for Miami's water problem is expected to result from the \$208,000,000 Central and Southern Flood Control Project, the initial stages of which are now nearing completion. The U. S. Army Corps of Engineers, which is in charge of this project, and the Florida State Division of Water Supply and Research, which is co-operating, believe that this project will not only prevent or reduce flood damage in south and central Florida, but will also protect wells against salt water intrusion and will conserve water during rainy seasons by means of reservoirs. There is a question in the minds of some water experts, however, as to whether stored water in the Everglades region of Florida will remain long because of seepage through the porous oolite and evaporation from the hot sun.

The geological formations underlying the Miami area are such an important factor in the city's water problem that a branch office of the U. S. Geological Survey is located adjacent to the office building of the Department of Water and Sewers. Close liaison is maintained at all times.

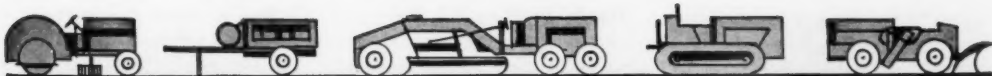
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**Wartime Water Supply**

(Continued from page 65)

801 (99.3%) were negative to *Bacterium coli*. Of the 6 which fell below this standard, 5 contained fewer than 10 *Bact. coli* in 100 ml. The Board's work in fact was so efficient that even in official quarters some credence was given to a dangerous fallacy—that the non-appearance of epidemics meant that the dangers to the population from polluted water had been exaggerated. The report also describes the measures taken to guard against the contamination of water stored in reservoirs by the dropping of bombs charged with such materials as poisonous gases. Daily testing of the water was continued as a routine throughout the war, and on no occasion was there any evidence that poisonous matter had gained access to it. Apart from its technical interest the report is a tribute to the loyal devotion of the members of the team who performed a vital task under very difficult circumstances during 6 years of war. ("Annotations", Brit. M. J., 8 March, 1952 and Navy Medical News Letter).





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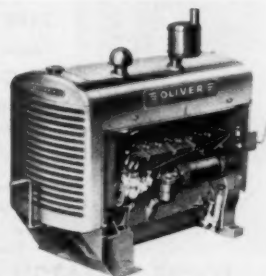
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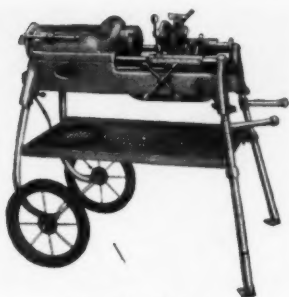
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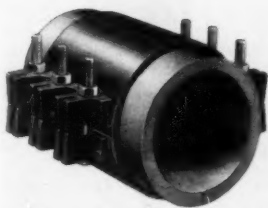
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### New Surveying Instruments by an Old Manufacturer

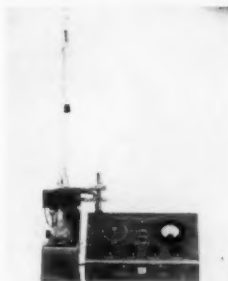
These moderate-priced instruments are designed to meet the needs of builders and contractors. Included are a convertible transit-level; a heavy-duty 12-inch dummy level; a service transit-level; and a hand level. A descriptive booklet giving complete specifications on these model N instruments will be sent on request to C. L. Berger & Sons, Inc., 37 Williams St., Boston 19, Mass., or use the coupon.

Use coupon on page 26; circle No. 6-13

### Quick and Simple Moisture Determination

An accurate determination of the water content of a material can be made with the Aquameter. Operations are completely automatic, and much faster than distillation techniques. Normally 1 to 2 minutes will be required for a complete determination. Accuracy is usually within 0.5%. Complete information in Bull. 276, sent on request by Beckman Instruments, Inc., So. Pasadena, Calif., or use the coupon.

Use coupon on page 26; circle No. 6-14



Measures water content.

### Get Year 'Round RAT CONTROL On Public Dumps with KELLY'S RAT CAFETERIA



Cutaway view shows food hopper and water fountain

### SAFE-CERTAIN-ECONOMICAL

Here is the proved, lowest-cost system for rat control in infested areas such as public dumps. Kelly's Rat Cafeteria is a portable, hopper-fed feeding system with an exclusive device which prevents bait waste. Hopper holds several months' supply of warfarin bait. Two-gallon automatic water fountain included. Made of heavy-gauge steel. Easy to clean. Padlocked for safety. Size 24"x24"x18".

Kelly's Rat Cafeteria comes complete with 50 lbs. of Kelly's warfarin rodenticide.

\$39.95 (f.o.b. Madison)

Write Dept. B for complete information and quantity prices.

**SOLVIT CHEMICAL COMPANY**  
SPEEDWAY ROAD • MADISON, WISCONSIN

- CONSTRUCTION CASTINGS
- MANHOLE COVERS
- CATCH BASIN INLETS

FOR

Highway • Municipal • Building  
Industrial • Communication •  
Public Works • Airport • Utilities  
Transportation

Patterns for 15,000 different Gray  
Iron Castings used on Construction Projects

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### NEENAH FOUNDRY CO.

NEENAH, WISCONSIN

Chicago Office

308 W. WASHINGTON ST.,  
Chicago, Illinois



## PLANNED FOR YOUR PROTECTION

CONTINENTAL Chain Link Fence provides better protection features—more value for your fence dollar. You get engineered erection; 12 fence styles; rigid framework secured by tough rods and wire; galvanized fabric, and welded gates. Get these plus features in Continental's "Planned-for-Protection" fence.

\*Trade Marks Reg. U.S. Pat. Off.

CONTINENTAL STEEL CORPORATION  
Kokomo, Indiana

Please send FREE copy of  
"Planned Protection"—complete manual on property protection.

Name \_\_\_\_\_

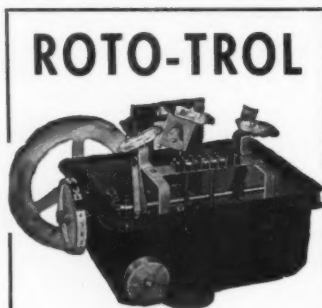
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State \_\_\_\_\_



**CONTINENTAL  
STEEL CORPORATION**



## ROTO-TROL RF-2 with ALTO-TROL

Puts that second pump to work.

A 2-pump RF-2 ROTO-TROL with a built-in ALTO-TROL will operate each pump on alternate starting cycles, assuring equal use and wear of both pumps. Operates both pumps when required.

Depth Indicator optional—extra.

Write for full data.

Water Level Controls Division

**HEALY-RUFF Company**

791 Hampden Ave., St. Paul 4, Minn.

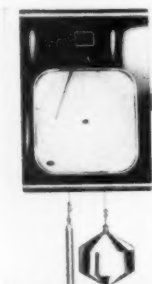
## Tape Protects Pipe Against Water, Acids, Alkalies

Dressertape is a polyvinyl chloride covering for pipe protection. The 10 mil tape has an insulation resistance of 100,000 megohms and dielectric strength of 10,000 volts. It provides effective resistance against water, salt water, acids, alkalies, oil and soil chemicals. It is applied cold and backfilling can be placed at once. Full information from Dresser Mfg. Division, Bradford, Pa., or use the coupon.

Use coupon on page 26; circle No. 6-15



Dresser pipe tape.



Bristol flow meter.

## Two Types of Open Channel Flow Meters

These open channel flow meters flow of water, sewage, industrial measure, record and control the plant effluent or irrigation water. Flow is determined by the head of a liquid flowing through a flume or over a weir. The meters are available in the mechanical or the electrical type. The electrical type records at any desired distance. Ask for Bull. F1606, Bristol Co., Waterbury, Conn., or use the coupon.

Use coupon on page 26; circle No. 6-16

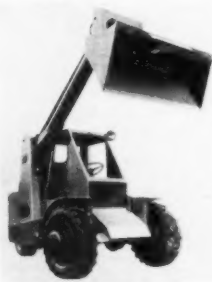
## Drills Fast and Far with Less Sharpening

This is a four-point drill, made in 1 1/8 to 2 1/4-inch gauge sizes, and in lengths up to 12 ft. The shank will fit any hammer. The steel and carbide bit are integral and of one-piece construction, so there are no attachments to loosen, bind or strip. It is claimed to drill faster and farther, with less gauge loss. Data from Rock Bit Sales & Service Co., 2514 E. Cumberland St., Philadelphia 25, Pa., or use the coupon.

Use coupon on page 26; circle No. 6-17



For faster drilling.



Scoopmobile loader.

## All-Hydraulic Scoopmobile Front End Loader

This model all-hydraulic, single boom, Scoopmobile has a 3/4-yard bucket, a lift capacity of 4,000 pounds and ability to discharge its load at a height of 8 ft. Handles material, or levels and backfills. Attachments available include swivel type concrete hopper, lift forks, and crane boom. Steering is hydraulic. More data from Mixermobile Manufacturers, 8027 NE Killingsworth St., Portland, Ore., or use the coupon.

Use coupon on page 26; circle No. 6-18

### Small Portable Air Compressors with Gas Engine Drive

There are three sizes of these compressors—21, 35 and 50 cfm. They are of the V-type, 4-cylinder, 2-stage design and are mounted on standard 2-wheel trailers for fast towing. Water-cooled gasoline engines drive the compressors. An enclosure that protects against weather and tampering is available. Data from DeVilbiss Co., 300 Phillips Ave., Toledo 1, Ohio, or use the coupon.

Use coupon on page 26; circle No. 6 - 19

### PERSONAL NEWS

M. Truett Garrett, Jr., who recently joined the staff of the Garrett Engineering Co., consulting professional engineers of Houston, Texas, has been awarded the degree of Doctor of Science in Sanitary Engineering by Massachusetts Institute of Technology. He was graduated from Texas A & M in 1948 with BSCE. We congratulate Messrs. Garrett, both senior and junior. We have always felt that more engineers should carry through to the higher degrees,

which require time and effort, but are well worth while.

David B. Lee, State Sanitary Engineer, State Board of Health, Jacksonville, Fla., has been elected president of the Florida Engineering Society.

Blucher A. Poole, Director of Environmental Sanitation for Indiana, recently had the misfortune to break his leg. He will be handicapped for some time.

Clyde R. Harvill, who has served for the past year as Chief of the Technical Engineering Branch, Water Resources Division, NPA, will return to Houston about July 1 to resume his duties with the Water Division of that city.

William G. Riddle is now associated with the firm of Charles A. Haskins, consulting engineer, Kansas City, Mo. In addition to Mr. Haskins and Mr. Riddle, P. Clifford Sharp is also a member of the firm, which specializes in water and sewerage engineering.

Walter S. Douglas and Alfred Hedefine have been made partners

in the consulting engineering firm of Parsons, Brinckerhoff, Hall & Macdonald, 51 Broadway, N. Y.

George F. Catlett, widely and favorably known to many sanitary engineers, died at Raleigh, N. C., on March 22. He served with the North Carolina and Florida State Departments of Health and in both wars—in the first as Captain, Corps of Engineers, and in the second as a civilian employee.

### ASSOCIATIONS

The New York State Sewage Works Association, which has previously held a January convention in New York City, has announced that, because of the October Sewage and Industrial Waste Association meeting in October in New York, the usual January meeting will be canceled.

The American Public Works Association annual convention will be held in Los Angeles, Calif., August 24 to 27. The meetings will be held at the Shrine Convention Hall. Don Herrick, 1313 East 60th St., Chicago 37, Ill., is secretary.

## Increase filter capacity...

without  
Expensive Plant Additions

install

**PALMER FILTER BED AGITATORS**

change to

**ANTHRACILT FILTER MEDIA**

Hundreds of repeat orders from satisfied customers prove that longer runs at higher rates with less wash water consumption are absolute facts, not claims.

Try *Agitators* and *Anthracilt* in one Filter and you too will eventually equip your entire plant.

For Information Call or Write

**PALMER FILTER EQUIPMENT COMPANY**

822 E. 8TH ST. — ERIE, PA.

PHONE 5-3416

## HAUCK Presents



Thawing Burner Equipment



Compound Melting Furnace



Lead Melting Furnace



Asphalt Tool and Cement Heater



Asphalt Surface Heater



### SPEED-MASTER MELTING KETTLE

for Asphalt • Tar • Pitch and Bituminous Compounds

- Melts up to 70% Faster
- Saves 50% on Fuel
- Safer to Operate

Features exclusive flash-proof lined flues, new well type oil burner, fast flow draw-off cock. Built in pneumatic-tired, steel wheel or skid types in 40 to 160-gallon sizes. Available with hand spray or power spray attachments. Write for bulletins on these kettles and on Hauck Asphalt Tool Heaters and Asphalt Surface Heaters.



Melting Kettle

**HAUCK MANUFACTURING CO.**

117-127 Tenth St.

Brooklyn 15, N. Y.



## USE THE GEOPHONE

Registered in U. S. Patent Office

### TO LOCATE LEAKS WITHOUT DIGGING!



Used by America's foremost water systems, government and industrial plants. Picks up vibrations from escaping water or steam at 50 feet. Also used successfully in oil, mining, and termite fields. Complete outfit of two Geophone discs, headpiece, connecting tubes, and carrying case.

Pipe Phones (AquaPhone)... \$3.70

### Globe Phone Mfg. Corp.

Manufacturers of Geophones Since 1918  
DEPT. P READING, MASS.

### Wanted

#### Chief Mechanical Engineer

The city of Burbank California desires applications for Chief Mechanical Engineer (Public Utilities) \$683-761. Before June 15, 1952 write to Personnel, City Hall, Burbank, California.

### STREET, SEWER AND WATER CASTINGS



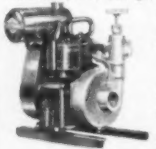
Various Styles, Sizes  
and Weights  
Manhole Covers and Steps  
Adjustable Curb Inlets  
Water Meter Covers  
Cistern and Coal  
Hole Covers

Gutter Crossing Plates  
Valve and Lampole Covers

Write for Catalog and Prices  
**SOUTH BEND FOUNDRY CO.**  
Gray Iron and Semi-Steel Castings  
SOUTH BEND 23, INDIANA

### DARLEY PORTABLE PUMPS

Powered by Briggs and Stratton gasoline engines. Automatic Primers. Centrifugals will handle without injury, water with sand, dirt and gravel content.



Model No. 15AE—  
Weight 61 lbs.  
Capacity up to 70 gallons per minute.  
Pressures up to 60 lbs.  
Model No. SAE—  
Weight 127 lbs.  
Capacity up to 160 gallons per minute.  
Pressures up to 55 lbs.  
Model No. SAE—  
Weight 171 lbs.  
Capacity up to 250 gallons per minute.  
Pressures up to 58 lbs.

W. S. Darley & Co., Chicago 12  
Write for 68-Page Municipal Supply Catalog

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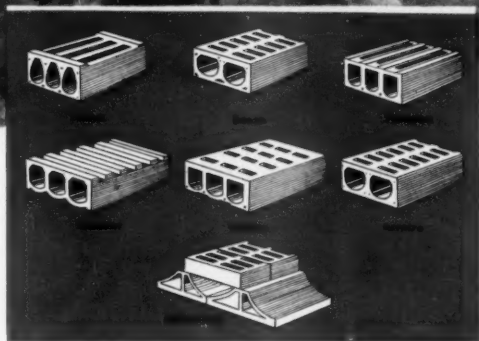
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for your money

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## For Better Trickling Filter Results



Left to right: Gene Weidner, Amer. Well Wks.; Olney Borden, Consulting Engineer; Quincy; Henry Courbis, McElwee-Courbis Constr. Co. at Monticello, N. Y. sewage treatment plant.



### USE GOOD EQUIPMENT

Everyone looks happy in this picture because they are installing one of those good AMERICAN WELL WORKS rotary distributors at Monticello, N. Y. They know this equipment, engineered by experts, can be expected to give excellent service.

And underneath the stone, where you can't see it, to insure better results they put a *specification* floor of vitrified clay filter bottom blocks . . . the best filter floor available.

### USE TFFI INSTITUTE SPECIFICATION UNDERDRAINS

The scientific design of these vitrified clay filter bottom blocks insures trouble-free operation for the life of the filter. They have large top openings. That means proper ventilation of all filter media and free discharge of the filter effluent at all times. They have smooth run-off channels. That means quick

drainage and no clogging. The blocks are light in weight, self-aligning and easy for unskilled labor to lay. After they have been laid they are strong enough to work on and to support even very deep filter media.

These modern underdrain blocks will carry applications up to 50 MGAD. They are best for all kinds and shapes of filters. They are used everywhere better operating results are desired.

Use them to insure best results from your next trickling filter. Give it a *specification* floor. Use TFFI vitrified clay filter bottom blocks. For full engineering details write any member of this Institute today.

## TRICKLING FILTER FLOOR INSTITUTE

Texas Vitrified Pipe Co.  
Mineral Wells, Tex.

Ayer-McCord-Regan Clay Co.  
Brazil, Ind.

National Fireproofing Co.  
Pittsburgh 22, Pa.

Bowenston Shale Co.  
Bowenston, Ohio

Pomona Terra-Cotta Co.  
Pomona, N. C.

W. S. Dickey Clay Mfg. Co.  
Kansas City 8, Mo.

Industrial Materials Co.  
Philadelphia 34, Pa.

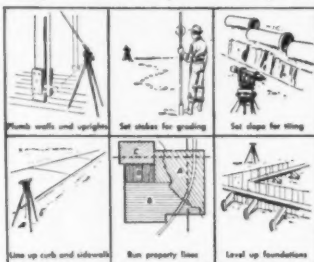
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## White Universal Level-Transit...

most versatile instrument you can own!

Indispensable for these jobs—and many more



ENGINEERS agree: you can do more jobs better — at lower cost — with the White "Universal" Level-Transit. The improved Model 3000 has internal focusing, coated optics, a guarded vertical arc. Plus all the other quality features needed to give you lifetime durability and accuracy. The price: *only \$185\**, complete with tripod. See your dealer, or write DAVID WHITE COMPANY, 399 W. Court Street, Milwaukee 12, Wisconsin.



We offer the most expert REPAIR SERVICE on all makes, all types of instruments.

\*Price subject to change without notice.

7197

## Worth Telling

by Arthur K. Akers



★ **ALLIS-CHALMERS MANUFACTURING COMPANY** sends us a picture of 30 motor graders leaving for the State Highway Department, Columbia, S. C. But you just can't put a 15-car train in a 2 1/4" magazine column! (We tried) A-C is also plant-expanding \$3 million worth at La Porte, Ind.



Mr. Dumser

★ **JOHN M. DUMSER**, formerly general sales manager, WOLVERINE TUBE DIVISION, succeeds George D. Potter as director of sales.

★ **WORTHINGTON CORPORATION** sends 4 centrifugal pumps to maintain high level in the Wanaque, N. J. reservoir with flood waters from the Ramapo River.

★ **ARTHUR P. HALL** is now vice president in charge of public relations and advertising, ALUMINUM COMPANY OF AMERICA, Pittsburgh.

★ **FOR** the W. A. RIDDELL CORPORATION, Bucyrus, Ohio, JOSEPH D. WHELAN takes over Pacific Coast sales; The VERN WHEELER EQUIPMENT COMPANY, Jacksonville, northern Florida and southern Georgia.

★ **DETROIT DIESEL ENGINE DIVISION** just produced its 350,000th Diesel. The whole industry had only made 60,000 of them, up until G.M.'S entry into the field in 1938.

★ **NEWS** from an old-friend LEE CHAMBERLAIN, president of BUILDERS-PACIFIC is that PAUL V. HENNESSY is sales manager for the firm's southern branch, in Los Angeles.

★ **LAYNE & BOWLER COMPANY** has a new 16mm color movie on ground water development entitled "Deep Water," a complete story of well water development. For your chance to show it, address them at Memphis 8, Tenn.

★ **THE NATURAL RUBBER BUREAU**, Washington, has opened its new research laboratory in Rosslyn, Va.

While research on rubber for paving is accented, all phases of highway and airport paving will be studied, too.

★ **MEILI-BLUMBERG CORPORATION**, New Holstein, Wis., has acquired the FRANK G. HOUGH COMPANY line of tractor sweepers, to manufacture and distribute.

★ **HENRY T. SULZER**, general manager of GRAVER WATER CONDITIONING COMPANY, New York, is now also vice president of the parent GRAVER TANK & MANUFACTURING COMPANY, East Chicago, Ind.

★ **MAJOR CHANGES** that took place June 1st in the advertising sales organization of PUBLIC WORKS will present new faces to most of you. LEWIS C. MORRIS is promoted from the Chicago office to become Eastern sales manager in New York. ROBERT J. SHEA moves up, from Cleveland to Mid-western sales manager at Chicago. BURTON M. YOST is advanced from New York to district manager at Cleveland. ARTHUR K. AKERS assumes the new post of director of advertising and research, in New York, but will continue his personal contacts with all our friends in Southern cities.

★ **DALE L. BUNDAY** is new district sales manager for GENERAL ELECTRIC communications equipment, handling a sizeable slice of the Southwest from Oklahoma City.



Mr. Courtright

★ **MARION POWER SHOVEL COMPANY**, Marion, O., elects JOHN P. COURTRIGHT president and general manager; MAURICE V. CORNELL, vice president, sales.

★ **ONE WORD** covers why economic controls work poorly. The word, "people."

—Universal Concrete "Pipe Dreams"

# LOCK JOINT

serves the  
**SOUTH**



**IF YOU'RE FROM THE SOUTH . . .** specifically Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Kentucky or Tennessee . . . our plant at Columbia, South Carolina, is ready and waiting to serve you. This Columbia plant, the fourth of our up-to-date permanent pressure pipe manufacturing yards, is equipped to produce Lock Joint Prestressed Concrete Cylinder Pipe in diameters from 16" to 48", designed for any pressure common to water works practice. The plant's central location in the Southeast makes it possible to deliver the completed pipe speedily and economically throughout this area.

**IF YOU'RE FROM ANY OTHER PART OF THE COUNTRY EAST OF THE ROCKIES . . .** our three other permanent pressure pipe plants located at Wharton, N. J.; Detroit, Mich.; and Turner, Kansas, stand ready to provide for your complete Reinforced Concrete Pressure Pipe requirements. All these plants are equipped to manufacture the most carefully designed modern Concrete Pressure Pipe in a large range of standard diameters, and have facilities to handle any contract however large or small.

SCOPE OF SERVICES—Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Main 16" in diameter or larger, as well as Concrete Pipes of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.

## LOCK JOINT PIPE COMPANY

Established 1905

P. O. Box 269, East Orange, N. J.

PRESSURE PIPE PLANTS: Wharton, N. J., Turner, Kan.,  
Detroit, Mich., Columbia, S. C.

BRANCH OFFICES: Casper, Wyo. • Cheyenne, Wyo. • Denver, Col. • Kansas City, Mo. • Valley Park, Mo. • Chicago, Ill. • Rock Island, Ill. • Wichita, Kan. • Kenilworth, N. J. • Hartford, Conn. • Tucumcari, N. Mex. • Oklahoma City, Okla. • Tulsa, Okla. • Beloit, Wis. • Hato Rey, P. R. • Caracas, Venezuela

**LOCK JOINT**  
*Reinforced Concrete*  
**PRESSURE PIPE**





### DISINFECTION

Chlorine applied up-sewer to prevent septicity subsequently ensures better disinfection at the sewage plant—usually with an overall saving of chlorine.

## CHLORINATION BY W&T

*Geared* TO BETTER  
SEWAGE PLANT PERFORMANCE



### SETTLING BASINS —

Chlorination keeps the sewage fresh and ensures continuance of proper settling in primary basin or Imhoff Tank.

**TRICKLING FILTERS** — Chlorine ahead of trickling filters on a programmed basis prevents septic odors and ponding — thus permitting biological oxidation to proceed normally.

**ACTIVATED SLUDGE UNITS** — Chlorination of the return activated sludge prevents bulking—and permits the activated sludge units to perform at maximum capacity.

Join the hundreds of sewage plants that are maintaining top performance of their treatment processes with chlorination — dependable, accurate chlorination by W&T.

**WALLACE & TIERNAN**  
COMPANY, INC.

CHLORINE AND CHEMICAL CONTROL EQUIPMENT  
NEWARK 1, NEW JERSEY • REPRESENTED IN PRINCIPAL CITIES